DOCUMENT RESUME

ED 427 809 JC 990 110

AUTHOR	Minear, Dorothy J.
TITLE	Models for Understanding and Predicting the Undergraduate Educational Attainment Patterns of Public Community College Students Who Transfer with the Associate in Arts Degree into a State University System.
PUB DATE	1998-00-00
NOTE	279p.; Doctoral Dissertation, Florida State University, Tallahassee.
PUB TYPE	Dissertations/Theses - Doctoral Dissertations (041) -- Reports - Descriptive (141)
EDRS PRICE	MF01/PC12 Plus Postage.
DESCRIPTORS	Academic Achievement; *Academic Persistence; Associate Degrees; *Bachelors Degrees; *College Transfer Students; *Community Colleges; Educational Trends; Enrollment Trends; Grade Point Average; Higher Education; Public Colleges; *Student Characteristics

ABSTRACT

This dissertation investigates academic performance, persistence, and baccalaureate degree attainment patterns for 12,824 community college students who transferred with Associate in Arts (AA) degrees to a state university system during the 1991-92 academic year. Analyses focused on students' attributes, academic background, transition, adjustment, and integration into the university. Variables with a significant effect on at least one of the outcomes included: (1) gender; (2) birth year; (3) community college grade point average; (4) time gap between community college and university enrollment; (5) average university composite Scholastic Aptitude Test score; (6) term of entry; (7) first-term course load; (8) first-term change in grade point average; (9) number of requested degree changes; (10) and change of institution within the system. A prediction model was developed that accurately classified 69% of the AA transfers as: (1) students who attained the baccalaureate from the system during the specified time; (2) students who remained enrolled in the system at the end of the specified time; (3) nonpersisters who left the system in good academic standing; or (4) nonpersisters who left the system not in good academic standing and did not return to graduate or to remain enrolled at the end of the investigation. Information from this investigation may be used by educators to make appropriate adjustments on campus policies and practices and to design support systems that will enhance transfer students' educational attainment. Contains 24 tables and more than 300 references. (AS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 427 809

THE FLORIDA STATE UNIVERSITY

COLLEGE OF EDUCATION

MODELS FOR UNDERSTANDING AND PREDICTING THE UNDERGRADUATE EDUCATIONAL ATTAINMENT PATTERNS OF PUBLIC COMMUNITY COLLEGE STUDENTS WHO TRANSFER WITH THE ASSOCIATE IN ARTS DEGREE INTO A STATE UNIVERSITY SYSTEM

By

DOROTHY J. MINEAR

A Dissertation submitted to the
Department of Educational Leadership
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

Degree Awarded:
Fall Semester, 1998

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☒ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY
D. Minear
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Copyright © 1998
Dorothy J. Minear
All Rights Reserved

JC 990 110

BEST COPY AVAILABLE

BEST COPY AVAILABLE

The members of the Committee approve the dissertation of Dorothy J. Minear defended on August 6, 1998.

Barbara A. Mann
Professor Directing Dissertation

Richard L. Tate
Outside Committee Member

Joseph C. Beckham
Committee Member

David W. Leslie
Committee Member

Approved:

Hollie B. Thomas, Chairperson, Department of Educational Leadership

To Norine,
who understood that it had little to do
with earning a doctorate.

Thank you.

TABLE OF CONTENTS

LIST OF TABLES vii

ABSTRACT ix

Chapter Page

1. INTRODUCTION 1

    Statement of the Problem 1
    Purpose of the Study 3
    Significance of the Study 5
    Organization of the Study 9

2. REVIEW OF THE LITERATURE 10

    Introduction 10
    Methodology for the Literature Search 11
    The Issue of Educational Attainment 12
    The Role of Public Community Colleges in Baccalaureate Degree Attainment 15
    Attrition/Retention and Academic Attainment Research 18
        Early Atheoretical Studies
        The Development of Conceptual Models
        Other Methodological Considerations
    Research Findings 33
        Student Persistence and Baccalaureate Degree Attainment Rates
        Variables Included in Educational Attainment Studies
        The Academic Performance, Persistence, and Baccalaureate Degree Attainment of Community College Transfers
    Critical Analysis and Summary 73

Chapter Page

3. CONCEPTUAL FRAMEWORK AND RESEARCH QUESTIONS 78

Introduction 78
Restatement of the Purpose 78
Conceptual Framework 79
Definition of Terms 81
Research Questions 86
Assumptions, Limitations, and Other Considerations 88

4. METHODOLOGY AND COLLECTION OF DATA 92

Introduction 92
Restatement of the Purpose 92
Research Setting and Population Under Study 92
Data Source and Development of the Data File 96
    Outcome Variables
    Discriminating Variables (Predictors)
Research Questions and Choice of Statistical Analyses 105
Statistical Considerations for the Logistic Regression Analyses 110
Statistical Considerations for the Predictive Discriminant Analyses 116

5. MODEL DEVELOPMENT AND RESULTS 121

Introduction 121
The Subjects of the Research 121
Descriptive Statistics for Intermediate Outcomes 122
Logistic Regression Analyses for Intermediate Outcomes 130
    Persistence Models
    Academic Standing Models
    Graduation Models
Summary of Logistic Regression Analyses 149
Descriptive Statistics for Final Outcome Groups 151
Predictive Discriminant Analysis Models for Final Outcomes 158
    Calibration Model
    Final Model for the Entire Sample
Use of Intermediate Logistic Regression Results to Predict
    Final Educational Attainment Classifications 175

Chapter Page

6. CONCLUSIONS AND RECOMMENDATIONS 177

Introduction 177
Summary of Findings 177
Discussion of Findings 181
Theoretical Framework
Relationship of Results with Earlier Research
Implications for Future Research 199
Implications for Practitioners 207
Conclusions 219

APPENDICES 223

A. Approval of Human Subjects Committee 223
B. Supplemental Tables 225

REFERENCES 241

BIOGRAPHICAL SKETCH 265

LIST OF TABLES

Table Page

1. Summary of Variable Characteristics for Entire Sample 123
2. Logistic Regression Results: Persistence Models 132
3. Hosmer-Lemeshow Goodness of Fit: Final Persistence Model 137
4. Logistic Regression Results: Academic Standing Models 140
5. Hosmer-Lemeshow Goodness of Fit: Final Academic Standing Model 143
6. Logistic Regression Results: Graduation Models 145
7. Hosmer-Lemeshow Goodness of Fit: Final Graduation Model 148
8. Summary of Variable Characteristics for Entire Sample Used for Discriminant Analysis 153
9. Final Outcome Rates by Race, Gender, and Age 154
10. Model for Predicting Educational Attainment Outcomes (Calibration) 163
11. Educational Attainment Outcome Group Contrasts -- Entire Sample 166
12. Final Model Predicting Educational Attainment Outcomes 171
13. Classification Function Coefficients for Final Model 173
14. Classification Results for Final Model (Equal Prior Probabilities) 173
15. Correlation Matrix for Entire Sample 226

Table Page

16. Summary of Variable Characteristics for Calibration Sample 227

17. Summary of Variable Characteristics for Cross Validation Sample 228

18. Summary of Variable Means by Group (With Standard Deviations) 229

19. Logistic Regression Results: Full Models for Calibration Sample 230

20. Logistic Regression Results: Reduced Models for Calibration Sample 232

21. Logistic Regression Results: Reduced Models for Entire Sample 234

22. Summary for Cases Not Fit Well by Final Logistic Regression Models 236

23. Summary of Variable Characteristics for Calibration Sample
Used for Discriminant Analysis 237

24. Educational Attainment Outcome Group Contrasts for Calibration 238

ABSTRACT

This investigation provides a better understanding of academic performance, persistence, and baccalaureate degree attainment patterns for 12,824 community college students who transferred with Associate in Arts (AA) degrees into a state university system during the 1991-92 academic year. Students were tracked until June 30, 1995. Effects were analyzed for variables operationally defined to represent students' attributes, academic backgrounds, transition, adjustment, and integration into the university and for which system-level data were available. A reduced set of variables was identified that, when considered simultaneously through logistic regression analyses, provided predictive information regarding AA transfer academic performance, persistence, and baccalaureate degree attainment within the specified time. Variables found to have a significant effect ($p < .05$) on at least one of the outcomes included gender, birth year, community college grade point average, time gap between community college and university enrollment, average university composite Scholastic Aptitude Test score, term of entry, first-term course load, first-term change in grade point average, number of requested degree changes, and change of institution within the system.

A prediction model was developed using discriminant analysis that accurately estimated whether AA transfers were (a) students who attained the baccalaureate from the

system during the specified time, (b) students who remained enrolled in the system at the end of the specified time, (c) nonpersisters who left the system in good academic standing (cumulative grade point average ≥ 2.0) and did not return to graduate or to remain enrolled at the end of the study, or (d) nonpersisters who left the system not in good academic standing (cumulative grade point average < 2.0) and did not return to graduate or to remain enrolled at the end of the investigation. The overall correct classification rate was 69%.

The design, implementation, and refinement of retention programs require a substantial investment of time and resources. Educational planners should establish new programs based on solid theoretical foundations and precise analyses of transfer students' educational attainment patterns. Educators can use the information from this investigation to begin to make appropriate adjustments in campus policies and practices and to design support systems that will enhance transfer students' educational attainment.

CHAPTER 1

INTRODUCTION

Statement of the Problem

Community college transfer students constitute a notable portion of the undergraduate population at many four-year colleges and universities in the United States. More students than ever before–particularly nontraditional, minority, and low-and middle-income students–are starting their college careers in two-year institutions. Many of these individuals aspire to attain at least a baccalaureate degree.

Several states have structured their postsecondary systems to promote the use of public community colleges as the primary entry point into higher education. Faced with increased demands for accountability of resources, institutional performance, and student outcomes, some state systems have responded by establishing extensive articulation policies to ease a student's progress from high school, to community college, and into a university.

Researchers and policy makers view students' completion of baccalaureate degree requirements as a benchmark of postsecondary educational attainment and as a measure of institutional performance and accountability. For individual students, earning the baccalaureate is positively associated with occupational, monetary, and other societal rewards. However, transfer students often have lower retention and graduation rates than the "native" students who begin their postsecondary careers at four-year colleges and universities. To achieve enrollment efficiency and meet the needs of this student population, college and university personnel need to gain a better understanding of the factors associated with transfer students' progression through undergraduate programs.

In the study of educational attainment, one must recognize that baccalaureate degree completion is, in one sense, a final undergraduate outcome measure, and students must achieve several intermediate outcomes before reaching that goal. Specifically, academic performance and persistence are important determinants of students' eventual levels of attainment. Also, administrators and policy makers often measure educational attainment by students' fulfillment of all degree requirements within a specified time.

Researchers have discovered that each student's undergraduate attainment is affected by a complex combination of factors, including the student's own attributes, academic background, aspirations, intentions, skills, and commitments to particular educational goals. Additionally, a student's attainment is influenced by how well that student makes the transition into the new environment, adjusts to the new intellectual demands, and integrates into the institution's social and academic communities.

A transfer student who has earned the associate degree already has demonstrated the ability to make the transition from high school to postsecondary education and to become sufficiently academically and socially integrated into the community college to persist to initial degree attainment. However, transfer students face another transition when they enter a senior institution. Their next level of educational attainment is dependent not only upon their own individual attributes, dispositions, and academic backgrounds, but also upon their ability to negotiate the passage into the new environment, adapt to new intellectual challenges, and become incorporated into social and academic communities that may differ substantially from the ones they knew at the community college.

These issues highlight the need for research that focuses specifically on the academic performance and persistence/withdrawal behaviors of students who have completed their Associate in Arts degrees at two-year institutions before transferring to four-year institutions to complete baccalaureate degree requirements. Research is needed that clarifies the distinctions among those transfer students who graduate within a specified time, those who remain enrolled, those who withdraw in good academic standing, and those who withdraw after experiencing academic difficulty. Once researchers have identified the factors that are related to the educational attainment of these students, university personnel can use this information to develop more effective strategies and programs to enhance transfer students' chances of graduation from baccalaureate degree programs.

Purpose of the Study

The purpose of this study was to investigate the educational attainment patterns of students transferring with Associate in Arts degrees from a state's public community college system into the state's public university system. (Hereafter, these students will be referred to as "AA transfers.") The academic performance, persistence, and baccalaureate degree completion of AA transfers who entered one of the State of

Florida's nine public universities for the first time during the 1991-92 academic year were examined through the end of the 1994-95 academic year.

Data consisted of information available on the State University System's Admissions File, Financial Aid File, and Student Data Course File. The study identified the relative effect of selected individual attributes of AA transfers and other selected variables operationally defined to represent the theoretical constructs of academic background, transition, adjustment, and integration into the university. Comparisons were made between (a) students in good academic standing (cumulative grade point average $\geq$ 2.0) and those not in good academic standing, (b) students who persisted and those who withdrew from the System, and (c) students who attained the baccalaureate from the State University System within the specified time and students who did not.

Additionally, the purpose of this investigation was to determine a prediction model that, using only data available at the System level, accurately estimated whether the AA transfers were (a) students who attained the baccalaureate from the State University System during the specified time, (b) students who remained enrolled in the State University System at the end of the specified time, (c) nonpersisters who left the System in good academic standing (cumulative grade point average $\geq$ 2.0) and did not return to graduate or to remain enrolled at the end of the study, or (d) nonpersisters who left the System not in good academic standing (cumulative grade point average $<$ 2.0) and did not return to graduate or to remain enrolled at the end of the investigation.

Significance of the Study

Throughout the history of American higher education, scholars have tried to understand and explain student attrition/retention behaviors and factors that influence students' levels of educational attainment. Initially, researchers usually conducted studies at individual, residential, four-year institutions, and they focused on the first-year attrition patterns of traditional, full-time students under the age of 25. Subsequently, researchers began to examine the persistence/withdrawal behaviors of other student populations (nontraditional students, commuter students, minority students, community college students, etc.). However, most of the early investigations rarely included multiple institutions or incorporated sufficient longitudinal data. As a result, researchers often classified students who temporarily stopped out or transferred to other institutions as dropouts. Most scholars in higher education now agree that the most meaningful research on undergraduate educational attainment covers a period longer than the traditional four years and uses precise operational definitions to differentiate among dropouts, stopouts, students who remain enrolled, and graduates.

Proponents of public community colleges have argued that these institutions have increased student access to postsecondary education because of their geographic proximity to students, lower tuition rates and the availability of financial aid, open admissions policies, developmental coursework, and various student support services. A disproportionate number of minority, low-income, and other nontraditional students initially enroll in the community colleges. Because one of the greatest concerns in higher education is how to increase the number of these students who earn baccalaureate degrees, educators are interested in improving the transfer function of community colleges and the subsequent success of transfer students.

However, few researchers have investigated community college transfer issues and the educational attainment of these students after they have transferred to senior institutions. Some researchers have examined student grade point averages during the first term or year after transfer. Using aggregate data, other researchers have focused on the retention and graduation rates of community college transfer students, particularly in relation to the rates for native students. Although research suggests that transfers differ from their native counterparts, researchers still know little about the factors that influence community college transfer academic performance, persistence, and baccalaureate degree attainment. Without such knowledge, university personnel are apt to base decisions related to student educational attainment upon what is known about the attainment of traditional native students, and thus fail to respond appropriately to the distinctive needs of transfer students.

Most studies have not differentiated among transfer students based on class level or hours earned prior to transfer. Even fewer studies have focused on the special characteristics and experiences of students who have transferred from community colleges having already attained their Associate in Arts degrees. In particular, few researchers have examined the differences among the AA transfer students who have been retained to graduation and those who have either withdrawn, transferred, or been dismissed for academic or other reasons.

These issues have both theoretical and applied importance, particularly in states that depend on community colleges to provide initial instruction to most students in public higher education. College and university personnel have continued to seek ways to enhance students' educational attainment. Within the last decade, faculty, staff, and administrators have developed multiple programs designed to ease students' transition from high school to college and to reduce attrition rates during the first year. Specifically, there has been a proliferation of program activity regarding the freshman-year experience. However, fewer colleges and universities have initiated special retention programs designed to ease transfer students' entry into upper-division coursework and to support their academic performance at the university.

The design, implementation, and refinement of retention programs can require a substantial investment of time and resources. Therefore, educational planners should establish new programs based on a solid theoretical foundation and a precise analysis of transfer students' academic performance, persistence, and degree attainment patterns. As research reveals those components that are under institutional control, college and university personnel can use this knowledge to make appropriate adjustments and to design support systems that will enhance transfer student persistence and educational attainment.

Such changes will serve individuals, institutions, and the public. The insights gained from this type of research will aid colleges and universities in designing educational support services suitable for this increasingly important segment of the college population. Appropriate institutional modifications have the potential to broaden opportunities for educational attainment, particularly to underrepresented segments of the population. Finally, institutional effectiveness can be improved through enhanced enrollment and the more efficient utilization of resources.

This study was conducted with the recognition that many variables beyond those identified for this research have an impact on transfer student educational attainment. Additional studies will be needed to identify the psychological and external factors that also might influence the educational attainment of AA transfers. However, educational planners have access to System-level data; obtaining psychological and environmental data on individual students involves more time and resources, and often these approaches are fraught with methodological complications. Planners can use the prediction model from this study, or some appropriate variation of it, to begin to identify those AA transfers most likely to be at risk of not completing baccalaureate degree requirements within a timely fashion. Then, university personnel will be in a better position to determine what additional research is needed and the best support services to offer to these students.

One additional point should be made regarding this study: As J. P. Bean pointed out in 1980, ". . . not all student attrition is bad. There may be very legitimate reasons for a student to leave an institution of higher education. The purpose of this [investigation was to discuss] . . . the determinants of student attrition, not to discuss the pros and cons of dropping out in individual cases" (p. 157).

Organization of the Study

The following chapter includes a review of literature relevant to the study of educational attainment of community college transfer students in American higher education. Because degree attainment can, in one sense, be considered a final outcome, the review also incorporates an evaluation of literature on the intermediate outcomes of academic performance, persistence, and progression toward graduation.

Based on the analysis of relevant literature, a conceptual framework is presented in chapter 3 that provided the focus for this investigation. Definitions are provided for key terms, specific questions are delineated to guide the research, and assumptions and limitations of the study are explained.

Presented in chapter 4 are descriptions of the research setting, the data source, the variables, and an outline of the statistical analyses that were performed. A discussion of the suitability of the chosen statistical procedures for these analyses is provided. Chapter 5 provides a detailed description of the development of the models and the results from the statistical analyses. Finally, presented in chapter 6 is a summary of the research findings and the final set of prediction models. The results are related to the review of the literature and to the conceptual framework for this study. Additionally, recommendations for future research, recommendations for practitioners, and conclusions are presented.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

This review will include an analysis of literature regarding the educational attainment of community college transfer students in American higher education. Because degree attainment can, in one sense, be considered a final outcome, the review also will incorporate an evaluation of literature on the intermediate outcomes of academic performance, persistence, and progression toward graduation.

Specifically, this review will provide a brief introduction to the construct of undergraduate educational attainment and the transfer role of community colleges. Because persistence is a necessary condition for baccalaureate degree completion, the review will include an overview of the evolution of attrition/retention research, the development of theoretical models, and a synopsis of methodological problems often associated with this kind of research. The review will incorporate an analysis of the extent of the attrition problem and a discussion of selected background and college academic variables found to relate to the persistence and educational attainment of the general student population in four-year colleges and universities. Then, the review will present a more detailed analysis of studies related to the performance, persistence, and baccalaureate degree attainment of community college transfers.

Methodology for the Literature Search

Prior to the review of the literature on college student persistence and baccalaureate degree attainment, several criteria focused the search. First, only studies conducted at postsecondary institutions in the United States were considered. Secondly, the search was limited primarily to documents written since 1980 (except those which provided historical perspective). Because early attrition literature was primarily descriptive, reviews of the literature provided most of the information regarding these studies (e.g., Astin, 1971, 1975, 1977; Chapman, 1982; Cope & Hannah, 1975; Hills, 1965; Knoell & Medsker, 1965; Pantages & Creedon, 1978; Spady, 1970; Summerskill, 1962; Tinto, 1975; 1987). Finally, emphasis was placed on finding studies free from serious methodological flaws.

The first step in the literature search was to identify key words and descriptors for accessing relevant documents. Because student academic performance and persistence are necessary steps leading to degree attainment (e.g., Kocher & Pascarella, 1990; Pascarella & Terenzini, 1991; Tinto, 1987), the literature review included studies in which researchers looked at student achievement and persistence/withdrawal behaviors as well as at actual graduation rates. The search revealed few studies that focused specifically on the persistence/withdrawal behavior of Associate in Arts transfers, and a restricted number of other studies that focused on transfers in general. Therefore, a broader search was conducted to look at factors related to the performance, persistence, and degree attainment patterns of college students overall.

The collection process began with a search of several computerized databases, including The Florida State University LUIS (Library Users Information Service), Dissertation Abstracts International, PsychLit, and Educational Resources Information Center (ERIC), a database consisting of documents cited in Resources in Education and Current Index to Journals in Education. Additional studies were located by analyzing bibliographies and reference lists in available books and journals.

These computerized and manual bibliographic searches yielded titles of relevant books; refereed journal articles related to the fields of higher education, sociology, and psychology; reports of federally, state-, and privately funded studies; papers presented at various professional meetings; documents sent to ERIC by individuals or institutions; and several doctoral dissertations.

Information included in the titles and/or abstracts reduced the number of studies further. The criteria mentioned above were used to assess the documents and narrow the collection for the final review. Most of the studies reviewed for this document were conducted at a variety of individual postsecondary institutions. Some researchers used national databases of longitudinal information for their investigations.

The Issue of Educational Attainment

Throughout the history of American higher education, faculty, administrators, and policy makers have been concerned with student attrition and why students have not persisted to baccalaureate degree attainment. As early as 1872, a speaker at the National

Education Association annual convention presented a paper regarding college student attrition (Kowalski, cited in Wiencke, 1994, p. 5). Summerskill (1962) reported that the more formalized study of college student attrition has a history going back to at least 1913.

In the 1970s, concern regarding potential declines in undergraduate enrollment prompted an increase in interest in student attrition and its causes (Pantages & Creedon, 1978; Pascarella, 1982; Porter, 1990). Since then, colleges and universities have encountered growing competition from other educational providers, and have faced increased demands for accountability of resources, for institutional performance, and for student outcomes. Therefore, educators, researchers, and policy makers have shown an increasing interest in students' progression through higher education, including how students enroll, stay enrolled, move through the higher educational system, attain their degrees, are dismissed for academic or other reasons, or drop out voluntarily.

Student attrition has multiple costs associated with it for students, institutions, and society in that attrition affects funding patterns, facility planning, curricula development, and students' levels of preparation for the future labor market (D. J. Jones & Watson, 1990). Many studies have shown that the completion of a baccalaureate degree is central to the determination of both occupational status and income (e.g., Astin, Tsui, & Avalos, 1996; Leslie & Brinkman, 1986; Pantages & Creedon, 1978; Pascarella & Terenzini, 1991).

Therefore, students and their parents have an obvious interest in retention because students who leave not only have expenses associated with time spent in college, but also may lose income later due to the lack of a formal degree. Students also face a possible loss of self-esteem when so many in our society perceive the noncompletion of degree requirements as failure.

For institutions and state higher educational systems, attrition has a heavy impact on institutional operations and finance (Pantages & Creedon, 1978). Colleges and universities bear the high costs of recruiting and admitting students, as well as the costs associated with the development and administration of programs designed for students who eventually may drop out or be dismissed for academic or other reasons. Additionally, most faculty and student affairs personnel care about students' degree attainment because they believe that this outcome signifies that their work with students has been successful.

For public institutions, in particular, taxpayers cover many of the costs for students who do not complete their degrees. The high rates of attrition also affect the public's confidence in the institutions of higher education and their ability to provide for the needs of the citizenry. Mortimer et al. (cited in Pascarella, Smart, & Ethington, 1986) reported that the Study Group on the Conditions of Excellence in American Higher Education (sponsored by the National Institute of Education) highlighted the importance of research on college student persistence by suggesting that persistence may be a prominent indicator of educational impact or excellence in colleges and universities (p. 47).

Concern with educational accountability has increased significantly in recent years. Nationally, there has been a surge of interest in assessment, student outcomes, and institutional effectiveness. Legislators and policy makers have focused more attention on graduation rates instead of just on enrollment as a measure of institutional performance and accountability. In 1991, the U.S. Congress passed the "Student Right-To-Know and Campus Security Act," which required higher education institutions to make public their institutional retention rates (Astin et al., 1996). Although policy makers see enrollment as an indication of the size of an educational entity, they see rates of degree attainment as one indication of what and how much an institution or an educational system is producing. "A degree awarded to an individual is an indication that the education system has helped make more knowledge and skill available in the economy and society" (U.S. Department of Education [USDOE], 1993, p. 97).

The Role of Public Community Colleges in Baccalaureate Degree Attainment

During this century, the community college has become a primary player in American higher education. Within the public sector, two-year institutions grew faster than four-year institutions in the late 1980s and the early 1990s (Cejda, 1994; USDOE, 1993). Enrollment in public two-year institutions now exceeds 5,308,000 students, more than 43% of all students enrolled in undergraduate education ("Almanac," 1996). Also, many four-year institutions have increased their reliance on the transfer market to stabilize or increase enrollment (Cejda, 1994).

Advocates of community colleges have contended that public two-year institutions have greatly increased access to higher education in the United States by providing "an inexpensive and convenient way for academically well qualified students to complete the first two years of college and a second chance for less qualified students to gain the skills necessary to complete college" (Pincus & DeCamp, 1989, pp. 191-192). In the fall of

1992, 19.6% of the students enrolled in four-year public institutions were minorities, whereas 26.2% of the students enrolled in two-year public institutions were minority (U.S. Department of Education [USDOE], 1995). Many scholars have agreed that community colleges provide access to higher education for a large percentage of nontraditional, minority, disadvantaged, and low-income students (e.g., Cejda, 1994; Cohen & Brawer, 1987, 1989; Commission on the Future of Community Colleges, 1988; Deegan, Tillery, & Associates, 1985; J. S. Eaton, 1988; Pincus & DeCamp, 1989; Rendón, 1993; Rendón & Matthews, 1989).

Higher education faculties and administrators, as well as legislators and the general public, have become increasingly concerned about the transfer function of community colleges, their articulation with senior institutions, and the subsequent success or failure of transfer students in obtaining baccalaureate degrees. In particular, interest in transfer achievement has escalated because so many upper-division students are transfers (e.g., Adelman, 1992; Archer, 1984; Astin, 1983; Best & Gehring, 1991; Brint & Karabel, 1989; Cejda, 1994; Cohen, 1984, 1987; Cohen & Brawer, 1989; Diaz, 1992; Dougherty, 1987; J. S. Eaton, 1991; Green, 1988; Kintzer & Wattenbarger, 1985; Pincus & Archer, 1989; Rendón & Matthews, 1989; Richardson & Bender, 1987; Scott & Gelb, 1983; Velez, 1985; Velez & Javalgi, 1987).

Based on arguments that more formalized state articulation and transfer policies assure better transfer opportunities for students statewide, several states have implemented significant articulation agreements among their higher education sectors (Bender, 1991; Dupraw & Michael, 1995; Hirshberg, 1992; Kintzer & Wattenbarger, 1985). For instance, in 1960, policy makers in California determined that community colleges were going to play a primary role in the State's three-tiered postsecondary structure. Because only the top eighth of California high school graduates were eligible for the University of California and the top third were eligible for California State University, most high school graduates had to enter higher education through the community colleges. Thus, the transfer function of the community colleges became crucial to maintaining access in an otherwise highly selective system (J. C. Jones & Lee, 1992).

Florida, which also has a postsecondary education structure based on a two-plus-two system, is considered a national leader in developing highly effective articulation at the State and local levels between and among institutions and sectors (Breyer, 1982; Cohen & Brawer, 1982; Swift, 1986). Banks (1994) reported that formalized articulation and transfer structures include a breadth of general education requirements, policies that guide course scheduling, and a full range of student services designed to ease students' transfer from two- to four-year institutions. In 1971, the Florida State Board of Education approved the "Florida Formal Agreement Plan," which was developed by the Division of Community Colleges and the State University System to assist students in the transfer process within the State of Florida. This Plan was followed in 1975 by a report entitled "The Community Junior College in Florida's Future" which clearly designated community colleges as the entry point for many students beginning their postsecondary education. A "General Education Agreement" guaranteed the transfer of all general education credits from a public community college to a State university. Also, this

Agreement prohibited the universities from requiring any additional general education courses if a student had completed a general education program at a community college. Since then, many other programs, systems, and activities have been developed that enhance the two-plus-two articulation system, including a common course numbering system throughout the community colleges and universities, a College Level Academic Skills Program, computerized academic advisement systems, program reviews, common placement testing, mandated articulation accountability processes, and common prerequisites for entry into similar baccalaureate programs (Florida State Board of Community Colleges, 1991, 1996).

Attrition/Retention and Academic Attainment Research

Early Atheoretical Studies

Braxton, Brier, and Hossler (1988) contended that attrition/retention research has fallen into one of two categories: atheoretical studies or theory-based studies. The atheoretical studies have been primarily descriptive, and have not worked from models or theories to generate hypotheses to predict causal links among variables associated with student persistence. In an early review of literature on college attrition, Knoell (1960) classified the descriptive studies she found as either census, autopsy, case, or prediction studies. The census studies simply documented the magnitude of attrition, retention, or transfer rates. In the autopsy studies, researchers employed post hoc or retrospective designs that focused on precollege characteristics of students and their reported reasons for leaving an institution. Case studies often involved the long-term follow-up of students who were considered high-risk students at the time of admission to an institution. In prediction studies, the authors generated prediction equations for various measures of college success, using numerous admission variables. Spady (1970) pointed out the unfortunate absence of analytical-explanatory studies from Knoell's list. He encouraged researchers to design such studies that would "focus on isolating underlying explanatory mechanisms" (p. 65).

Although educators have conducted numerous studies, the research has suffered from methodological and definitional problems. Researchers have been inconsistent in how they have operationalized the terms "persister," "completer," "dropout," "nondropout," and "noncompleter." As early as 1962, Summerskill observed that some researchers had defined "attrition rate" as the percentage of students lost to a particular department within a college or university, whereas others defined it as the percentage who left the institution, or who left higher education altogether. Pantages and Creedon (1978) and Porter (1990) cautioned that, in many early studies, authors defined persisters as students who obtained their degrees within four years from the college or university which was attended first. Some researchers included those students who were still enrolled at the end of the study. Others defined nondropouts as those who eventually graduated from college. Later, some authors differentiated between institutional departure (which included transfers, stopouts, dropouts, and dismissals) and system departure (which included only those students who dropped out altogether, at least through the time of the given study). In other studies, authors made none of these distinctions (Brigman, Kuh, & Stager, 1982; Tinto, 1987).

Tinto (1982) pointed out that, although all types of withdrawal can be considered dropout from an institutional perspective, each type does not require the same kind of response from the college or university. He maintained that policy makers at each institution must decide which forms of nonpersistence they consider to be part of the natural functioning of higher education, and which types of nonpersistence deserve policy action or the development of intervention strategies. They must define dropout in terms of educational as well as institutional goals.

Tinto (1982) also noted that, at the state level, it is important to distinguish between transfer and total withdrawal behaviors. He contended that one should note which transfers take place within the public sector, which take place within the state, and which involve a transfer to an out-of-state institution. From an organizational perspective, dropout occurs only when a person leaves and/or stops participating in the form of higher education under the jurisdiction of that organization.

Most early retention/attrition research consisted of descriptive and bivariate correlational studies at isolated institutions. Attrition in these studies was linked to either student demographic, social, or psychological characteristics or to institutional traits, such as size, location, and prestige (Pantages & Creedon, 1978; Spady, 1970; Tinto, 1982). Many researchers surveyed students who left specific institutions with the hope of finding patterns in the reasons students gave for leaving. Braxton, Brier, and Hossler (1988),

among others, questioned whether the reasons cited for leaving college in these autopsy studies accurately reflected the underlying causes of student attrition.

Many early studies focused on factors associated with academic achievement, which has correlated positively with persistence (Spady, 1970; Pascarella & Terenzini, 1991). However, several authors have cautioned researchers of the need to focus on additional variables, because scholastically high achieving students have dropped out at rates higher than predicted (e.g., Noel et al., 1987; Pantages & Creedon, 1978; Spady, 1970). Noel et al. (1987) reported that problems existed when researchers considered academic dismissals with voluntary withdrawals because, on the average, fewer than 25% of all students leaving colleges or universities departed because they were or would soon be forced to leave. Most students left of their own accord.

The Development of Conceptual Models

The major weaknesses of the early atheoretical studies were that they could only describe observations and present correlations between variables. They could not indicate causation. Many researchers recognized that the diversity of student background characteristics and the students' experiences added to the complexity of the problem (Astin, 1975). It became clear that no single factor explained college student attrition and that the students withdrawing from college varied with respect to their precollege educational history, reasons for attrition, and the probability of their continuing their higher education later (e.g., Pantages & Creedon, 1978; Pascarella & Terenzini, 1991; Terenzini & Pascarella, 1980; Tinto, 1975, 1987).

To address some of these deficiencies, several researchers began to develop theoretical frameworks to guide their examination of student attrition/retention. Since the late 1960s, several formal theories and models of student performance, persistence/ withdrawal, and degree attainment have been advanced. They have included psychological theories that emphasize the impact of individual abilities and dispositions, societal theories that stress the importance of external factors, and economic theories that emphasize fiscal factors (Tinto, 1987).

Informed and guided by these theoretical frameworks, researchers began to conduct more sophisticated and conceptually complex analyses of the data, using such techniques as multiple regression, multivariate analyses, and path analyses. The researchers employed statistical procedures that allowed them to control variables, examine a variety of interaction effects among variables, and develop more parsimonious analyses (e.g., Bean & Metzner, 1985; Pantages & Creedon, 1978; Pascarella, Duby, & Iverson, 1983; Pascarella & Terenzini, 1991; Rootman, 1972; Spady, 1970; Tinto, 1975).

Spady (1970, 1971) has been credited with developing the first explanatory, sociological theoretical model of the student dropout phenomenon. Spady (1970) began

> with the assumption that the dropout process is best explained by an interdisciplinary approach involving an interaction between the individual student and [the student's] particular college environment in which [the student's] attributes (i.e., dispositions, interests, attitudes, and skills) are exposed to influences, expectations, and demands from a variety of sources (including courses, faculty members, administrators, and peers). The interaction that results provides the student with the opportunity of assimilating successfully into both the academic and social systems of the college. To the extent that the rewards available within either system appear insufficient, however, the student may decide to withdraw. (p. 77)

Borrowing from the suicide theory of Emile Durkheim, Spady posited that, just as shared group values and friendship support were expected to reduce suicide, so would they be expected, by analogy, to reduce dropout.

Spady's work was followed by the work of Tinto in 1975 and the work of Pascarella in 1980. In each of these three models, social integration and academic integration, which correspond to shared group values and friendship support, were expected to influence the dropout decision. All three models looked at students' decisions regarding persistence and dropout as an outcome of a "multivariate longitudinal process" (Gilbert & Gomme, 1986, p. 229).

Spady (1970, 1971) identified background characteristics as important in the dropout process–specifically, family background, academic potential, ability, and family socioeconomic status. He theorized that shared group values, grade performance, intellectual development, normative congruence, and friendship support would lead to increased social integration. Social integration would increase satisfaction, which would increase institutional commitment, which would reduce the likelihood of a student dropping out.

Tinto (1975; 1987; 1988) developed an explanatory/predictive persistence model based on theories from social anthropology and psychology. He drew on the work of Arnold Van Gennep regarding the notion of "rites of passage" to explain the longitudinal process of student persistence (Tinto, 1987, p. 93). According to Tinto (1987; 1988), Van Gennep described life as a series of "passages" from one group to another, or from one status to another. Building upon this conceptual framework, Tinto described college life as a series of "passages" through which students progress. He proposed that students take the first step when they separate from families, schools, and communities to enter a new environment. Next, they enter a period of transition as they abandon past patterns of behavior and norms. Finally, they are incorporated into the new social and academic communities of the college or university. According to Tinto, students are likely to leave the institution before graduation if they fail to negotiate these passages successfully.

Tinto (1987) also referred to the work of Durkheim for "a way of thinking about the largely informal process of interaction among individuals on campus which leads to incorporation into the life of the college," and he classified types of student departure similar to how Durkheim classified types of suicide. Tinto wrote:

> When one views the college as a social system with its own values and social structures, one can treat dropout from the social system in a manner analogous to that of suicide in the wider society. . . . Presumably, lack of integration into the social system of the college will lead to low commitment to that social system and will increase the probability that individuals will decide to leave college and pursue alternative activities. (p. 99)

Tinto (1982; 1987) contended that student persistence/withdrawal behavior is influenced by four clusters of variables: background characteristics and secondary school experiences, initial commitments, academic and social integration, and subsequent goal and institutional commitments. He theorized that students enter college with a unique set of precollege characteristics, including family background, individual attributes, and secondary school experiences. These factors interact with each other to influence students' levels of commitment to particular institutions and to the goal of graduation. Within the academic realm, this initial goal commitment influences academic performance and intellectual development. Academic integration is determined primarily by these factors, and it leads to modified goal commitment.

In the social realm, institutional commitment influences interactions with peers and faculty, which determine the level of social integration, which modifies institutional commitment. The new levels of institutional and goal commitment determine the likelihood of whether students will persist or withdraw. Tinto (1982; 1987) concluded, other things being equal, that students' integration into the academic and social systems of the institution has the greatest influence on the subsequent commitment to the institution and commitment to graduation, which, in turn, have a direct positive influence on students' persistence and degree attainment.

Many researchers have built on Tinto's work, either expanding constructs, validating the model, or adapting it for specific institutional settings or special student populations (e.g., Aitken, 1982; K. L. Anderson, 1986, 1987; Ashar & Skenes, 1993; Bean, 1980, 1982, 1983, 1985; Cabrera, Nora, & Castañeda, 1993; Cabrera, Stampen, & Hansen, 1990; Christie & Dinham, 1991; Donovan, 1984; Getzlaf, Sedlacek, Kearney, & Blackwell, 1984; Metzner & Bean, 1987; Munro, 1981; Nora, 1987; Nora, Attinasi, & Matonak, 1990; Nora & Rendón, 1990; Pascarella, 1980, 1982; Pascarella & Chapman, 1983a, 1983b; Pascarella, Smart, et al., 1986; Pascarella & Terenzini, 1977, 1979, 1980, 1983; Stoecker, Pascarella, & Wolfle, 1988; Terenzini, Lorang, & Pascarella, 1981; Terenzini & Pascarella, 1977, 1978, 1980; Terenzini, Pascarella, Theophilides, & Lorang, 1985; Theophilides & Terenzini, 1981; Villella & Hu, 1991; Wiencke, 1994). Most of the study results have been supportive of the general predictive validity of the model and its primary theoretical constructs of academic and social integration (Stoecker et al., 1988).

In his 1980 model, Pascarella emphasized the importance of informal interactions between students and faculty. He proposed that background characteristics interact with institutional factors which influence informal contact with faculty members, other college experiences, and educational outcomes. Pascarella found "that modest, but statistically significant, positive associations exist between amount of student informal, nonclass contact with faculty and such educational outcomes as satisfaction with college, educational aspirations, intellectual and personal development, academic achievement, and freshman to sophomore year persistence in college" (p. 564).

The Spady, Tinto, and Pascarella models have several common attributes. Each has been established on the premise that the critical element in student persistence is the degree to which there exists a good match between a given student and the environment at a given institution (Gilbert & Gomme, 1986). The social and academic integration of the student with the institution (based on Durkheim's work) serves as the theoretical base for each model. Each author has described attrition as a longitudinal process: They all have posited that students' background characteristics influence the manner in which they interact with the college environment, which leads to educational and attitudinal outcomes, which ultimately lead to a decision to persist or to leave the institution. Finally, the complexity of the models has increased their accuracy, but, according to Bean (1982), reduced their generalizability. He cautioned that the "extent to which the models can be generalized depends to a great extent on how research using these models is operationalized–specifically, whether questions relating to academic and social integration are specific to an institution or more general" (p. 23).

Although many models regarding student persistence and degree attainment have used different variables and nomenclature, they appear to have as a common theme the notion that persistence and therefore educational attainment primarily depend on the student's fit or match with the college environment (for example, Bean, 1980, 1985; Cope & Hannah, 1975; Pascarella, 1980; Spady, 1970, 1971; Tinto, 1975, 1982, 1987). The "college fit" model (or needs/press model) has provided an important theoretical framework for understanding the causes of attrition. College fit theorists have maintained that students enter a college or university with certain skills, attitudes, dispositions, and expectations. The institution places certain demands on the students; the extent to which they can meet the demands of the college or university and derive satisfaction from doing so is the degree to which they can be expected to persist to degree attainment (Pantages & Creedon, 1978, pp. 94-95).

Several other models have received attention in the higher education literature. Rootman (cited in Bean, 1982) developed a person-role fit model that focused on the relationship between student characteristics and the particular role requirements of students at a given institution (p. 19). Astin's (1977, 1984) involvement model (another goodness-of-fit model) focused on the need for students to have a point of identification with the institution, if not full integration. Bean (1982) developed a "synthetic model of student attrition" that included background variables, organizational variables, student intentions, environmental variables, outcome and attitudinal variables, and demographic variables for statistical control (p. 27). Other models exist for special student groups or students at a particular kind of institution, but most researchers have used one of these models as a foundation from which to build a new model.

Although Tinto (1987) indicated that external commitments would have an influence on persistence, he did not specify any of these in the model. In studies of traditional students, Cabrera et al. (1993) merged Tinto's (1975, 1987) and Bean's (1985) theoretical frameworks, developing an integrated model of student retention that included environmental variables as measures of external commitments. These authors theorized that the external environment affects a student's academic and social integration, the student's commitment to the institution and to an educational goal, the intention to continue in college, and persistence behavior. They found that student satisfaction with financial support and support from parents and friends influenced the persistence process. Many other studies also have shown the influence of hours of work, finances, family and personal problems, and outside encouragement on persistence (e.g., Aitken, 1982; Bean & Metzner, 1985; Cabrera, Castañeda, Nora, & Hengstler, 1992; Cabrera et al., 1993; Chacón, Cohen, & Strover, 1986; Ehrenberg & Sherman, 1987; Kraemer, 1995; Nora, 1987, 1996).

Other Methodological Considerations

The examination of the literature revealed that, although many researchers have conducted studies regarding student academic performance and persistence, their focus and their levels of methodological rigor have varied substantially. As with so many education-production studies, researchers frequently have encountered methodological problems of analysis when they have tried to determine if a given factor produced the desired effects.

The nature of the research samples has varied significantly, with some researchers focusing on a few students at a single institution and others utilizing national databases with hundreds or thousands of students from multiple institutions. Results from single-institution studies often have not been generalizable. On the other hand, Pascarella and Terenzini (1991) cautioned that large national studies have the potential to identify "statistically significant differences or changes that may or may not have comparable educational, administrative, or policy significance. This potential is an artifact of the sensitivity of tests of statistical significance to large sample sizes: The larger the sample size, the more likely one is to detect statistically significant relations between and among variables" (pp. 14-15).

Many researchers have focused on samples of traditional students with respect to age, sex, residency, and attendance status (full-time), and have conducted trend analyses or compared group means (Stampen and Fenske, 1988). However, they often have had insufficient databases for maintaining information to differentiate among various student groups. Methodological problems also have resulted from differences in when researchers have collected data, geographical regions, types of institutions, and the actual measurement of success criteria.

In many studies, researchers have limited the length of time for data collection. Therefore, they frequently have provided information on student persistence through several terms only, instead of until graduation or at least over an extended number of years. Typically, researchers have chosen to study freshmen through the first year and into the second year (Nora & Horvath, 1989). Most models of student persistence have not been tested to any extent with upper division students (Gilbert & Gomme, 1986). Pascarella et al. (1983) contended that, by concentrating primarily on students in the lower division, researchers have limited knowledge of those factors that may influence student persistence in the upper division.

When researchers have limited the time of their studies, they often have labeled students who were not continuously enrolled or who transferred as "unsuccessful" (e.g., Getzlaf et al., 1984; Gilbert & Gomme, 1986; Pantages & Creedon, 1978; Tinto, 1975). This issue has become increasingly critical, because students have been extending their postsecondary education over a longer period of time (Hill & Owings, 1986).

Savicki, Schumer, and Stamfield (cited in Pantages & Creedon, 1978) contended that investigators needed finer discriminations between categories of student outcomes to obtain more refined research results and to improve "understanding of the many ramifications of attrition" (p. 52). Prediger and Rose and Elton (also cited in Pantages & Creedon, 1978, p. 52) pointed out the weaknesses of using a two-way analysis of dropouts and nondropouts instead of a more comprehensive four-group analysis. They suggested that students should be classified as (a) academically successful persisters (who have a grade point average ≥ 2.00), (b) unsuccessful persisters (grade point average < 2.00), (c) successful dropouts (grade point average ≥ 2.00), or (d) unsuccessful dropouts (grade point average < 2.00).

Terenzini (1982) classified the early research designs as (1) post hoc or autopsy designs, (2) cross-sectional designs, or (3) longitudinal designs. Some of the deficiencies of the autopsy design have been discussed already. Pantages and Creedon (1978) observed that some researchers reported data on students who had withdrawn from an institution, but did not report any data on those students who persisted to graduation. The resulting inability to sort out the unique characteristics of the students who left weakened the validity of the conclusions for these studies.

Longitudinal designs have allowed researchers to study the same group over time, which has ensured some comparability of subjects. Unlike the autopsy design, longitudinal research that includes surveying students has been developed to allow students to respond to present circumstances, beliefs, and values, rather than to try to remember past events and experiences. Major disadvantages of this kind of longitudinal design have related to the time, money, and human resources needed to conduct the studies. Sometimes, researchers have found it difficult to get students to cooperate in the research process over an extended period of time. On the other hand, researchers who have utilized cross-sectional designs have been able to study larger groups at one time, but they have risked bias resulting from selection differences among groups of students (Terenzini, 1982).

As mentioned previously, researchers have differed substantially in how they have operationally defined and measured various constructs (Diaz, 1992; Pantages & Creedon, 1978; Pascarella & Terenzini, 1991). For a long time, there was a dearth of sound theoretical models for assessing the effects of particular factors on student persistence and degree attainment. Researchers tended to create their own models, leading to incongruity in the variables used from study to study.

In the student persistence and educational attainment literature covered in this review, researchers chose a variety of data collection designs and types of statistical analyses to assess the information. Some researchers utilized descriptive techniques in early autopsy studies. Many researchers have continued to use bivariate procedures when a multivariate approach would have been more appropriate because it could reduce the "family-wise" Type I error rate; repeated bivariate tests of significance lead to an increased likelihood of rejecting a null hypothesis that is true (Terenzini, 1982).

Some of the alternative methods that researchers have used include multiple regression, multivariate analysis of variance, factor analysis, discriminant analysis, path analysis, logit analysis, and various other LISREL analyses (e.g., Bean, 1980; Nora & Cabrera, 1993; Nora & Rendón, 1990; Stage, 1987; Stage & Rushin, 1993; Terenzini, 1982; Terenzini & Pascarella, 1977, 1980; Tracey & Sedlacek, 1987; Voorhees, 1987).

In general, researchers have had difficulty gathering consistent, well-defined data; isolating the effects of a specified factor from the plethora of other potential influences and causes of student persistence and degree attainment; and dealing with problems inherent to the chosen statistical procedures themselves (Leslie & Brinkman, 1993). Given this outline of but a few of the methodological and interpretational concerns associated with this kind of research, one should interpret the following overview of research findings related to student persistence and degree attainment with these cautions in mind.

Research Findings

Student Persistence and Baccalaureate Degree Attainment Rates

An examination of the literature revealed that student persistence rates and rates of baccalaureate degree attainment have remained relatively stable throughout the twentieth century. In the thirty-five studies that he reviewed which were conducted between 1913 and 1962, Summerskill (1962) found that about half of the students obtained baccalaureate degrees within four years. In 1937, McNeely (cited in Porter, 1990, p. 1) reported that the completion rate was 55%. Pantages and Creedon (1978, p. 55) and Porter (p. 1) cited several other studies by Iffert, Little, Cope, Hannah, and Tinto that also reported a 50 to 60% completion rate. In 1977, Terenzini and Pascarella reported that retention rates remained at about 50% throughout the first half of the twentieth century. These figures altered slightly during the post-World War II era, when many veterans entered college (Tinto, 1982). Tinto estimated that, except for that time, the baccalaureate degree attainment rate remained relatively stable from 1880 to 1980, with approximately 55% of the students completing degree requirements. This trend existed even though the characteristics and numbers of participating students changed drastically, as did the very nature of American higher education itself.

In these reports, however, the authors often made no distinction between a student's temporary and permanent withdrawal from college. Therefore, the eventual graduation rates may have been higher (Boyle, 1989). Pantages and Creedon (1978) estimated that 40% of the students who entered higher education would graduate from the institution they entered initially. In 1972, Astin found that, in a nationwide sample, 58.5% of the students who had enrolled in higher education in 1966 had graduated or were still enrolled six years later. In an analysis of a sample of students surveyed in the 1980-86 *High School and Beyond* study, Porter (1990) reported that 55% of the students either had completed degree requirements or were still enrolled at the end of a six-year period. Only 41% of all the students attained their baccalaureate degrees within this time, but 46% of the students who enrolled full time immediately following high school graduation obtained their degrees within six years.

In their compilation of data "weighted to approximate the national norms for all first-time, full-time entering freshmen in the fall of 1985," Astin et al. (1996, pp. 3-4) found that 39.9% of the students attained a baccalaureate within four years, 44.9% within six years, and 45.7% within nine years. They inferred from this information that extending the reporting period from the conventional six-year period to nine years did not greatly affect rates of overall degree attainment.

Variables Included in Educational Attainment Studies

In the profusion of studies that researchers have conducted on undergraduate educational attainment, they have chosen many different variables to represent the theoretical constructs of individual attributes, educational background, transition factors, institutional characteristics, academic and social integration, and persistence. Several of these variables will be discussed in the following sections. However, a comprehensive analysis of current literature on each pertinent variable is beyond the scope of this review. Readers are referred to the meta-analyses and literature reviews listed in the reference section of this document for additional information on specific variables (e.g., Leslie &

Brinkman, 1993; Pascarella & Terenzini, 1991).

Gender. The earliest reviews of attrition/retention studies revealed that women were less likely to persist than men, but that many of the women who withdrew left voluntarily as opposed to leaving for academic reasons. Subsequent studies indicated either little or no difference in attrition based on gender, or they reported mixed results (e.g., Astin, 1972; Cope & Hannah, 1975; Pantages & Creedon, 1978; Spady, 1970; Summerskill, 1962; Tinto, 1975). In the past two decades, more young women have obtained degrees, and by 1994, a similar percentage of men and women in the 25-29 age group had earned the baccalaureate degree or more (USDOE, 1995).

The National Center for Educational Statistics (USDOE, 1995) reported that, between 1976 and 1987, women were just as likely as men to enroll in college in the fall following high school graduation. However, since that time, more women than men have been enrolling upon high school graduation, particularly in four-year institutions. The two-year college enrollment rates upon high school graduation have been similar for women and men. Robertshaw and Wolfle (1983) found that delaying the start of college had a stronger negative effect on women's degree attainment than on men's degree attainment. They also reported that stopping out was more likely to reduce women's chances of completing degree requirements.

Some of the studies reviewed by Pantages and Creedon (1978) revealed that gender was an important factor in attrition at some institutions and not at others (p. 58). For instance, some studies indicated that the ratio of men to women on a given campus appeared to be related to attrition behaviors. Alexander and Eckland (cited in Pascarella

& Terenzini, 1991) indicated that institutional selectivity may have a stronger positive influence on men's degree attainment than on women's (p. 409). However, Anderson (also cited in Pascarella & Terenzini, 1991, p. 409) concluded that institutional quality, as determined by selectivity and financial resources, may have a stronger positive influence on women's attainment than men's attainment.

In a variety of studies, researchers have reported that gender has interacted significantly with other variables (e.g., Bean, 1980; Pascarella, Smart, et al., 1986; Pascarella & Terenzini, 1983). Some researchers have found significant differences in the factors influencing persistence for men and women, and, therefore, they have emphasized the importance of conducting separate analyses for men and women.

Ethnicity. Several of the college-age populations that currently have the greatest potential for growth include Blacks, Hispanics, and Native Americans (El-Khawas, 1995; Evangelauf, 1992). Despite their concentration in two-year institutions, Black and Hispanic students have been just as likely as White, non-Hispanic students to aspire to a baccalaureate or an advanced degree (U.S. Department of Education [USDOE], 1989). However, many authors have documented the fact that college students from these minority groups have been less likely to persist and attain baccalaureate degrees than their White peers (e.g., Astin, 1982; Astone & Nunez-Womack, 1990, 1991; Bender, 1991; Gosman, Dandridge, Nettles, & Thoeny, 1983; Hodgkinson, 1992; Porter, 1990; Rendón & Matthews, 1989; Sedlacek, 1987). For instance, in 1994, 16% of the Black high school graduates between the ages of 25 and 29 had completed a baccalaureate or higher, as compared with 30% of the White high school graduates, and 13% of the

Hispanic graduates (USDOE, 1995).

In their Wisconsin study, Stampen and Fenske (1988) found that, after academic performance in high school, ethnic background was the dominant predictor of persistence at the college level, with Whites and Asians more than twice as likely to stay in school as Blacks, Hispanics, and Native Americans. These authors cited a study by Baum (p. 348) reporting similar results.

In an analysis of a sample of students surveyed in the 1980-86 *High School and Beyond* study, Porter (1990) found some variation among persistence rates for different ethnic groups. Whereas almost 20% of the students in the entire sample had dropped out by the third semester, Asian Americans were more likely to persist (approximately 10% left), and Black students were more likely to leave, particularly from public institutions (approximately 25%). In this same study, the author noted that the Hispanic student dropout rate appeared to increase substantially after four semesters. Porter reported that completion rates for Blacks and Hispanics were between 25 and 30%, compared to more than a 50% completion rate for Whites and Asian Americans.

Some authors have contended that different variables have been important predictors for different minority groups. The National Center for Educational Statistics (USDOE, 1995) reported that Hispanic women earned substantially more bachelor's degrees than Hispanic men. Duran (1986) reported that high school grades have not been as good a predictor for Mexican American students. Olivas (1986) found that whether a Latino student was a first-generation college student was an important factor. Porter (1990) found no relationship between socioeconomic status and baccalaureate degree attainment for Hispanic students. Hispanics who have completed college have taken longer, on average, than Whites. Of 1990 college graduates, 60% of Hispanic students completed in five or fewer years, compared to 72% of White students. Scholars have conjectured that these students often may have taken longer to graduate because they have changed schools or majors, stopped out, or taken a reduced course load for financial, academic, or personal reasons (USDOE, 1995).

Several aspects of academic preparation have served as good predictors of Black college student persistence. Among all the variables he considered, Astin (1982) found Black students' high school grade point average or high school class rank to be the "most consistent and substantial predictor" of undergraduate persistence (p. 92). Hood's (1992) research reaffirmed this assertion. Although there has been only a weak relationship, Scholastic Aptitude Test (SAT) scores also predict undergraduate persistence for Blacks. Astin (1982) found other factors to be positively related to Black student persistence, including enrollment in a college preparatory curriculum in high school (particularly one with more science and foreign language courses) and the development of good study habits.

Other researchers have found several demographic characteristics to be positively associated with persistence among Blacks: being a woman, being younger, parental income, parental education, and attendance at integrated high schools (Astin, 1982; McCauley, 1988). When they statistically controlled academic ability and socioeconomic status, Mow and Nettles (cited in Trippi & Cheatham, 1991) discovered that retention rates for Black students were as high as or higher than those for White students (p. 342). Gosman et al. (1983) also found significant differences in retention rates and progression rates between Black and White student cohorts, but they reported that racial differences disappeared when they controlled for other student and institutional characteristics. Although subgroups were small, Porter (1990) found that minority students with high ability and low socioeconomic status were considerably more likely to graduate than minority students in general, particularly from private schools.

Robertshaw and Wolfle (1983) reported that Black students who delayed entering college after high school were less likely to persist when they did enter college. Other authors reported that work and family obligations influenced minority persistence and degree attainment more than for the average college student (Astin, 1977, 1982; Chacón et al., 1986; Duran, 1986).

The retention rates for Blacks at predominantly White institutions have been particularly low (McCauley, 1988; Miller, 1988; Pascarella, 1985; Sedlacek & Webster, 1978; Trippi & Cheatham, 1991). However, when they monitored students for a longer period of time (nine years), Astin (1982) and Pascarella (1985) discovered that the percentages of Black students graduating from predominantly White institutions were similar to the percentages graduating from predominantly Black institutions. Of the Black students followed in a longitudinal study, only 24% obtained a bachelor's degree in four years, but 51% had completed the baccalaureate after nine years.

Those Black students who began their postsecondary education in community colleges were less likely to attain the baccalaureate, whereas Black students attending institutions in the Northeast and Black students attending higher quality institutions (as measured by faculty salary, expenditures, student-faculty ratios, tuition, selectivity, and prestige) were more likely to persist. Pascarella (1985) also found that, for Black men, the number of institutions attended and the size of the first institution attended were more strongly negatively associated with degree attainment than for White men.

Recent research regarding the factors that influence Black student persistence has suggested that attrition is strongly associated with academic problems and poor grade performance. (See Pascarella, 1985, for multiple references.) Hood (1992) found that Black men were more likely to leave the college or university due to academic dismissal, whereas Black women were more likely to leave voluntarily.

Steward, Jackson, and Jackson (1992) reported that Black students experienced a greater sense of alienation on predominantly White campuses than their White peers. Their research indicated that successful Black students changed interaction styles to accommodate either predominantly White or predominantly Black campus situations. Mallinckrodt (1988) found support from the campus community to be crucial for Black students, whereas support from family was most important for White students. Trippi and Cheatham (1989; 1991) found that special counseling programs for Black students were important for ensuring their persistence to graduation. In another study, Giles-Gee (1989) noted a correlation between Black students' lack of affiliation with the college and a decreased desire to remain in school and a possible decline in academic performance.

Age. Most scholars have identified adult students as those who are 25 or older and traditional students as those younger than 25 years of age. Several studies have found withdrawal to be greater among adults than among traditional-age students (Astin, 1975; Bean & Metzner, 1985; Greer, 1980).

Some research has indicated that variables related to traditional-age student attrition have not been the same as those related to older students (e.g., Bean & Metzner, 1985; Cleveland-Innes, 1994; Donovan, 1984; Farabaugh-Dorkins, 1991; Kayla & Others, 1982; Metzner & Bean, 1987). For instance, when testing the validity of Tinto's model for special populations, researchers discovered that, with nontraditional populations, academic integration had a greater effect than social integration (Bean & Metzner, 1985; Donovan, 1984). At the same time, Bean and Metzner (1985) found that high school rank was not as strong a predictor as expected for adult students. In another study, Villella and Hu (1991) found nontraditional students to be influenced to a greater extent by external factors (i.e., family and job responsibilities) that increase stress and the possibility of departure.

Socioeconomic status. Researchers often have cited socioeconomic status as critical to persistence (e.g., Carroll, 1989; Duran, 1986; Mingle, 1987; Peng, 1977; Wolfle, 1985). Mingle found that high-income students were four times more likely to attain their baccalaureate degrees than low-income students.

When academic ability and socioeconomic status have been considered together, several researchers have found the likelihood of baccalaureate degree attainment more strongly associated with measures of academic ability than with socioeconomic status (e.g., Astin, 1975; Manksi & Wise, 1983; Tinto, 1987). Porter (1990) found little difference between the overall degree attainment rate for high-ability/low-socioeconomic-status students and an entire student sample. However, when Porter disaggregated the data according to ethnic status, variations did exist.

Hearn (1992) conducted an assessment of students who delayed entry into higher education or who enrolled part time. Hearn found that, among graduates, a disproportionate number of students from low socioeconomic backgrounds pursued one of these nontraditional enrollment options.

Educational background and achievement. The literature on undergraduate student persistence and educational attainment has offered substantial support for the contention that precollege educational background and achievement are related to students' persistence/withdrawal behaviors (e.g., Lenning, Beal, & Sauer, 1980; Ramist, 1981; Wolfle, 1985). Numerous researchers have used high school grades and grade point averages in their studies of the dropout phenomenon. Others have examined the relationship between high school class rank and college persistence. In their review of the early literature, Pantages and Creedon (1978) reported that rank was twice as stable a predictor of student withdrawal as academic aptitude scores. Other authors reported that preparation and actual coursework in high school also had a direct effect on persistence (Christoffel, 1986).

Pascarella and Chapman (1983b) reported lower high school grades for students who withdrew voluntarily from four-year commuter institutions; Getzlaf et al. (1984) found similar results at a public residential university. However, when Pascarella and Chapman assessed persistence in residential institutions, they found that high school grade point average, combined with other background characteristics, was only indirectly related to persistence through campus-related experiences during the first year.

Astin (1975; 1985) concluded that past academic achievement most consistently predicted college attrition. Other authors also have reported the positive association of high school grades and admission test scores with baccalaureate degree attainment (e.g., Mingle, 1987; Nettles, 1984). Pantages and Creedon (1978) found that high school grades, along with class rank, were the best predictors of persistence and degree attainment, but they indicated that these variables seldom correlated as highly with student withdrawal from college. On the other hand, Porter (1990) discovered that completion was positively related to ability, and withdrawal was negatively associated with ability (derived from high school grades and an academic ability test score). Stampen and Cabrera (1988) also found academic performance in high school to be the single most powerful predictor of persistence.

Time gap between high school and college. Kempner and Kinnick (1990) and Nunley and Breneman (1988) concluded that when one chose to enter higher education was critical to baccalaureate degree attainment. Carroll (1989) found that student persistence through four years was strongest for those who entered a four-year institution full time in the fall immediately after high school graduation. However, Nunley and Breneman found that students who attended a community college right after high school had higher rates of baccalaureate degree attainment than those who delayed entry into postsecondary education altogether. After statistically controlling certain background and aspiration variables, Robertshaw and Wolfle (1983) found that delays in entering college had statistically significant negative effects on the number of years of college completed.

Institutional variables. Researchers have found that a number of institutional characteristics have an impact on students' transition and adjustment to college and, therefore, an indirect effect on persistence and degree attainment. For instance, some authors have reported that retention rates can vary based on the size, selectivity, and nature of institutional control of a given college or university (e.g., Pascarella & Terenzini, 1991; Porter, 1990).

Some researchers have contended that one important aspect of a student's transition into and experience in a college is how that student makes sense of the new environment. These authors have posited that college size may be particularly important in college adjustment because it may contribute to a student's feelings of anonymity, sense of community, and level of isolation. They also have asserted that college selectivity, which represents the general level of academic ability among the student body, may pose academic adjustment challenges for the student (e.g., Attinasi, 1989; Hurtado, Carter, & Spuler, 1996; Pascarella & Terenzini, 1991).

However, reports related to the influence of institutional size on educational attainment have contained inconsistent and at times contradictory conclusions. After controlling for student precollege characteristics and various institutional traits, E. F. Anderson (1984, 1987) found that attending a large institution had a negative influence on persistence and degree attainment. Other researchers who utilized similar statistical controls reported no significant relationships between measures of institutional size and baccalaureate degree attainment (Stoecker et al., 1988).

One hypothesis referenced by Pascarella and Terenzini (1991) was that institutional size may have a negative, indirect impact on educational attainment because students find it more difficult to become socially involved and integrated at the larger institutions. Pascarella and Terenzini (pp. 379-380) reported that the inhibiting influence of size had been noted even when researchers controlled "for salient student precollege traits, place of residence during college, and other institutional characteristics such as selectivity, percentage of White students as compared to percentage of Black students, and percentage of men as compared to percentage of women (for example, . . . Baird, 1987; Pascarella, 1984a, 1985d; Stoecker & Pascarella, 1988; Stoecker, Pascarella, & Wolfle, 1988)."

Stoecker et al. (1988) studied baccalaureate degree attainment for a national sample over a nine-year period. After controlling statistically for high school achievement, socioeconomic status, initial higher education aspirations, initial institutional commitment, college grades, and social involvement, the researchers found measures of college selectivity and institutional financial resources to be significantly and positively related to degree attainment. Ramist (1981) found that selective institutions tended to graduate more of their students than less selective colleges and universities, even after differences in the composition of the student bodies were taken into consideration. Other researchers (e.g., E. F. Anderson, 1984, 1987; Ethington & Smart, 1986; McClelland, 1990; Pascarella, Smart, Ethington, & Nettles, 1987) found that institutional selectivity had statistically significant, although small, positive effects on attainment. According to

Lenning, Beal, et al. (1980) and Tinto (1987), the increased selectivity of an institution increased student commitment to an institution, and therefore influenced student persistence and degree attainment.

Beal and Noel (1980) reported that persistence rates were higher at private institutions than at public institutions, whether they were highly selective, selective, traditional, liberal arts, or open enrollment. After controlling statistically for various background and institutional factors, Smart (1986) found that students attending private colleges were more likely to attain the baccalaureate degree. Porter (1990) found that after two years, four-year public institutions had significantly higher dropout rates than four-year private institutions, with withdrawal rates increasing at less selective institutions. After six years, public institutions had a higher percentage of students still enrolled and working on their degrees than did the private colleges and universities.

Student financial aid. One factor receiving considerable attention has been student financial aid. Unfortunately, the effects of student financial aid on persistence have been somewhat unclear, because the findings have varied from study to study. The majority of the research surveyed for this review indicated that, for the general student population, financial aid has had a positive impact on student persistence (e.g., Ahson & Gentemann, 1994; Carroll, 1987; Leslie & Brinkman, 1993; Murdock, 1990; Noel et al., 1987; Nora, 1990; Nora & Horvath, 1989; Stampen & Fenske, 1988). However, after conducting a meta-analysis, Pascarella and Terenzini (1991) contended that, after controlling for differences in academic ability among those receiving and those not receiving financial assistance, "receipt of general financial aid [had] no statistically significant net effects on persistence and degree attainment" (p. 406). They found this conclusion to be indicative of the mixed results they discovered among cited studies. The researchers then conceded that financial assistance may have been compensating, at least partially, for the negative effects of low socioeconomic status on educational attainment by allowing these students to persist at rates equal to (but not exceeding) those of students who did not demonstrate a need for the aid.

Stampen and Fenske (1988) reported on a study conducted by Stampen and Cabrera in Wisconsin in which they attempted to establish a basis for determining whether student aid eliminated financial reasons for dropping out of college. Finding no statistical differences between persistence rates of students receiving and those not receiving aid, the researchers interpreted these results to mean that, indeed, student aid was effective in the fashion desired.

Murdock (1990), in conducting a meta-analysis of other research, discovered that the length of time over which persistence was measured influenced the effect size. The effect of financial aid was stronger for longer periods, having more of an impact after the freshman year. Other studies reported that financial aid had a stronger impact on students at two-year institutions and at private institutions as opposed to four-year and public colleges and universities. Some studies implied that financial aid had a stronger impact on full-time students than on part-time students. Additionally, some studies indicated that women who received financial aid were more likely to drop out than men during the freshman year, but women aid recipients were more likely to persist to graduate "on time" (Murdock, 1990, p. 217).

Between the early 1970s and the early 1980s, substantial changes were made to the form of financial aid packages offered to college applicants. St. John and Noell (1989) found that all types of aid packages had a strong positive effect on students' decisions to persist in college. Other studies suggested that some financial aid packages might have been more beneficial than others. Stampen and Cabrera (cited in Nora & Horvath, 1989, p. 306) discovered that a low attrition rate was associated with student participation in work-study programs, either as a stand-alone form of aid or in combination with other types of assistance.

Researchers have raised questions about the effect of loans on student persistence, with some finding a negative effect and others finding no differences between the effect of loans and other forms of aid (Nora & Horvath, 1989). Astin and Cross (cited in Stampen & Fenske, 1988, p. 346), and several other researchers cited in Pascarella and Terenzini's meta-analysis (1991, p. 406), found that students receiving grants and work-study awards persisted at a higher rate than students receiving just loans. Murdock (1990) found that a combination of aid forms was more effective than one type of assistance. Jensen (1985) reported that a combination of the three forms of assistance had a small positive effect on degree attainment, as did a package consisting primarily of loans, with some grant aid. However, the researcher discovered that a package consisting primarily of grants, with some loan assistance, had a negative effect on persistence.

Vorhees (cited in Murdock, 1990) found that one form of loan, the National Direct

Student Loan, had a stronger positive effect on student persistence than other forms of financial aid. These loans had lower interest rates than other loans, and often were directed toward students from middle and upper socioeconomic backgrounds. Other studies found loans had a negative effect on persistence (Leslie & Brinkman, 1993; Murdock, 1990; Nora & Horvath, 1989).

Murdock (1990) contended that, in a meta-analysis, the weighted average effect size of loans by themselves approached zero, indicating that, even though the loans may not have increased rates of persistence, they also might not have led to higher attrition rates. In this analysis, a combination of loans and grants had a higher average effect size than either in isolation. The author acknowledged, though, that this result may have been an artifact of the dollar amount of the financial aid package, as opposed to the form of the package (p. 217).

In the meta-analysis, Murdock (1990) found that, of the variables under consideration, the actual dollar amount of financial aid packages had the largest positive effect size on persistence. This finding was supported by the work of Leslie and Brinkman (1993), who also found that students who received more financial aid tended to persist longer.

A number of studies have supported the contention that scholarships and grants have facilitated the persistence of Black students (Astin, 1982; Crosson, 1987). Astin also found that Black student participation in part-time work-study programs was

positively associated with persistence, whereas longer working hours off campus had a negative influence on persistence.

Cibik and Chambers (1991) cited several data sources that suggested that the cost of education was a major concern for minority students, and that financial aid was the primary means of paying for the college education. Baird (cited in Nora & Horvath, 1989) found that Blacks and Hispanics relied much more often than Whites on governmental aid, campus-based aid, and employment to support their higher educational endeavors (p. 302).

In those studies that did address racial differences, many reported that financial aid appeared to have a stronger impact on college attendance for Black and Hispanic students than for White students (St. John, 1991; St. John & Noell, 1989). Jackson (1990) reported that Blacks and Hispanics responded more positively than Whites to financial aid, but that when background and academic attributes were taken into consideration, the effect of student aid for Hispanics disappeared.

According to the meta-analysis conducted by Leslie and Brinkman (1993), minority students receiving financial aid persisted at a lower rate than White students. However, the researchers did not control for academic ability in this study, so interpretation of results was difficult. Murdock (1990) also found a lower rate of persistence for minority students receiving financial aid than for White aid recipients. In this study, the "average nonwhite financial aid recipient would have a persistence rate less than 41.3% of the white financial aid group" (p. 217). Murdock concluded that, even though financial aid promoted persistence among minorities, the assistance was not sufficient to overcome some of the other challenges that had a negative impact on minority retention.

Student satisfaction, commitments, and aspirations. Higgerson (1985) reported that students often have withdrawn from college because they have been dissatisfied with academic programs, have had unclear career objectives, or have had unclear educational goals. In their study of transfers, stopouts, and dropouts, Brigman, Kuh, and Stager (1982) found that the majority of the students who transferred left because the institution did not offer the desired type of academic program. The stopouts and dropouts left more frequently because of a lack of career focus or because of financial problems.

Vaala and Levitz (cited in Bauer & Bauer, 1994, p. 116) contended that many students have withdrawn because of inconsistencies in their perceptions about an institution. Bean (1980) found that a student's perception of the practical value of the college education for self-development and for getting a job was directly and significantly related to academic satisfaction. Bean and Bradley (1986) found that academic satisfaction affected academic performance directly. Johnson's (1987) study of community college transfers provided limited support for this finding. Many other investigators also found that a student's satisfaction with the quality of the education at an institution directly influenced persistence (e.g., Aitken, 1982; Higgerson, 1985; Johnson, 1987; Munro, 1981).

Research has indicated that theoretical constructs such as commitment to a specific institution, commitment to the goal of college graduation, and experience with the academic and social systems of an institution have an effect on student withdrawal decisions (e.g., Allen, 1994; Munro, 1981; Pascarella & Terenzini, 1980; Pascarella &

Chapman, 1983b; Terenzini et al., 1985). Allen and Nora (1995) found that goal commitment had a significant direct effect on students' persistence. Other researchers have found that a student's level of educational aspiration also has an independent and significant influence on ultimate educational attainment (e.g., Astin, 1975; Ethington, 1990; Pascarella et al., 1987; Stoecker et al., 1988).

Adjustment and academic and social integration. Researchers have found that, if students are to successfully negotiate the passage from high school to college, or from one aspect of college life to another, they have to adjust to new environments and to new patterns of behavior and norms before they can be incorporated into the social and academic communities of the college or university (Tinto, 1987). Researchers have addressed some aspects of college adjustment, either by implication or by including some measures that represent college adjustment directly in their models (Bennett & Okinaka, 1990; Chartrand, 1992). Adjustment has been defined as institutional commitment, feelings of academic adjustment, and the absence of psychological distress. Bennett and Okinaka conceptualized college adjustment as the "opposite of transitional trauma," which they defined as the "level of alienation a student experiences when unfamiliar with the norms, values, and expectations that predominate" (p. 37).

Multiple studies have offered support for the theory that a student's adjustment to an institution or the overall fit between a student and an institution can have an effect on persistence (e.g., Bennett & Okinaka, 1990; Braddock, 1981; Braxton & Brier, 1989; S. B. Eaton & Bean, 1995; Pantages & Creedon, 1978; Ramist, 1981). Authors have used different terms to refer to this fit, including "integration," "involvement," "congruence," and "satisfaction" (Pascarella & Terenzini, 1991).

Researchers have operationalized the concept of academic integration with an assortment of variables, including grades, measures of intellectual development, and contacts with faculty. Poor academic performance often has signaled adjustment problems. Numerous investigators have found a college student's grade point average at the end of the first term to be a notable indicator of adjustment to the intellectual demands of a given institution and an equally important predictor of persistence and eventual degree attainment (e.g., Aitken, 1982; K. L. Anderson, 1986; Bean, 1980; Ethington & Smart, 1986; Hilton, 1982; Johnson, 1987; Pascarella & Terenzini, 1991; Spady, 1971; Stoecker et al., 1988; Tinto, 1982). Pascarella and Terenzini (1991) have pointed out that, although academic ability and intelligence influence grades in college, they are not the only factors involved; personal motivation, organization, study habits, and quality of effort also affect grades. Therefore, as a measure of successful academic adjustment, "grades tend to reflect not only requisite intellectual skills but also desirable personal work habits and attitudes" (p. 388).

A word of caution is in order, though: Summerskill (1962) reported that poor grades have been a far more stable predictor of attrition than good grades have been a predictor of retention, because successful students have dropped out in larger numbers than expected. Many researchers have found students' voluntary withdrawal to be positively associated with (1) the holding of values incongruent with those that characterize the social and intellectual climates of the institution; and (2) low levels of personal interaction with faculty members and other students, especially outside the formal classrooms and offices of the college (e.g., Astin, 1977, 1984; Pascarella & Terenzini, 1977). Peer relationships, extracurricular involvement, use of college facilities, residence, orientation and advising, and financial aid and on-campus work all have been positively associated with persistence (Churchill & Iwai, 1981; Pascarella & Terenzini, 1991; Pascarella, Terenzini, & Wolfle, 1986).

Some studies have indicated that measures of academic and social integration have differential effects for various subpopulations of students, although research results have been inconsistent. For instance, Pascarella and Terenzini (1983) found that social integration for women had a somewhat stronger direct effect on persistence than did academic integration. Allen and Nelson (1989) reported that social integration had the stronger effect for women, albeit an indirect effect. Ethington and Smart (1986) found academic integration to be more important for men. In a later study, Pascarella, Ethington, and Smart (1988) did not find significant differences in the impact of social and academic integration on degree attainment for men and women.

Steward et al. (1992) reported that Black students who have more meaningful contacts with peers and faculty at predominantly White institutions have higher levels of social integration. However, Pascarella and Terenzini (1991) reported that several studies have suggested that academic integration may be a stronger predictor of Black student persistence than social integration. Other researchers have reported that social integration has been just as important as academic integration for this population. In one study by Pascarella (1985), the relative influence of academic and social integration on degree completion was almost equal for Black women, but social integration was a much stronger influence for Black men. Hood (1992) found that campus support and social integration (as well as high school class rank and ACT scores) were predictive for Black women's persistence after one semester, but only high school class rank served as a predictor for Black men in this study.

Research results regarding the impact of academic and social integration also have varied across types of institutions. In support of Tinto's model, the research has shown that, in traditional four-year residential institutions, academic integration and social integration have both had a significant effect on explaining retention (Pascarella & Terenzini, 1977, 1983; Terenzini & Pascarella, 1980). Pascarella and Chapman (1983a; 1983b) checked the validity of the Tinto model to predict voluntary withdrawal and persistence among first-year students at four-year residential institutions, four-year commuter institutions, and two-year commuter institutions. They determined that, although the model's overall prediction was a statistical improvement over chance, social integration was more strongly related to persistence at residential institutions. Academic integration was more strongly related to persistence at commuter institutions.

Within the last decade, faculty and administrators have developed multiple programs designed to ease students' transition from high school to college and to reduce attrition rates during the first year (El-Khawas, 1995). Multiple studies have indicated that students who participate in freshman seminar courses have a greater likelihood of persisting through their freshman year (Pascarella & Terenzini, 1991). However, in their review of related literature, Pascarella and Terenzini reported that several researchers have suggested that academic and social integration may not be as important to persistence after the freshman year. Additionally, these authors reported that higher levels of academic integration may compensate for lower levels of social integration and vice versa.

Investigators have found that a student's level of academic and social integration can influence the student's decisions regarding transfer and stopping out of higher education. Additionally, researchers have discovered that the continuity of students' college experiences can influence degree attainment. In particular, evidence has suggested that students who transfer among institutions have been less likely to persist and graduate (Pascarella, 1985; Pascarella & Terenzini, 1991; Tinto, 1987). Pascarella found that the number of colleges attended by students who initially enrolled in a four-year institution had a small, but statistically significant, negative impact on baccalaureate degree attainment, when he statistically controlled for a number of precollege characteristics, the characteristics of the first institution in which the student enrolled, and measures of social and academic accomplishment and integration while in college. Kocher and Pascarella discovered similar results in a study conducted in 1988. Pascarella found the negative impact of transfer to be particularly pronounced for Black men.

Some researchers have shown that interruptions in a student's college career also negatively influence degree attainment. After statistically controlling certain background and aspiration variables, Robertshaw and Wolfle (1983) found that interruptions in one's college attendance had statistically significant negative effects on the number of years of college completed.

The Academic Performance, Persistence, and Baccalaureate Degree Attainment of

Community College Transfers

The community college student transferring to a university is faced with a variety of special challenges. The new institution often differs from the community college in size, location, difficulty of the curriculum, and competition among students. A review of literature on community college transfers produced mixed results regarding students' levels of success at senior institutions as measured by grades, persistence, and baccalaureate degree attainment (e.g., Alba & Lavin, 1981; Astin, 1983; Cohen, 1984; Cohen & Brawer, 1982; Graham, 1987; Graham & Dallam, 1986; Green, 1985; 1988; Hughes & Graham, 1992; Richardson & Doucette, 1982; Velez, 1985). The review also revealed that few researchers have examined theoretical models of transfer behavior or have tested specific quantitative transfer models (e.g., Nora et al., 1990; Nora & Rendón, 1990).

Transfer student persistence and baccalaureate degree attainment rates. Pascarella and Terenzini (1991) concluded that "there is consistent evidence that initial attendance at a two-year rather than a four-year college lowers the likelihood of one's attaining a bachelor's degree" (p. 372). In 1982, Astin reported results from a national survey indicating that, on the average, 70% of students who began their college careers at four-year institutions graduated with at least a baccalaureate degree within fourteen years. In comparison, only 26% of public community college entrants obtained baccalaureate degrees within that time frame. Pincus and Archer reported in 1989 that, on the national level, only 10-15% of all community college students were obtaining baccalaureate degrees. In a more recent NCES (USDOE, 1997) study of transfer students, only 25% of the community college transfers who had entered as freshmen in 1989-90 had received a bachelor's degree by 1994. However, another 44% were still enrolled at a four-year institution, for an overall persistence rate of 70%.

One must remember that community college students have varied greatly from four-year college entrants relative to their backgrounds, abilities, and aspirations. In 1987, Dougherty estimated that between 30 and 40% of all community college entrants aspired to a baccalaureate. But, Dougherty went on to report that many students withdrew from the two-year institutions, students often experienced difficulty transferring to the four-year institutions, and more students withdrew after transfer. Therefore, these community college entrants "attain[ed] significantly fewer bachelor's degrees and years of education than similar students who enter[ed] four-year colleges" (p. 88).

In their early study of community college transfers, Knoell and Medsker (cited in Ackermann, 1991) found that 45% of the students who transferred as juniors completed their baccalaureate degrees within two years, and 62% had completed degree requirements within three years (p. 212). Newlon and Gaither (1980) tracked a group of community college students who transferred to a four-year institution as juniors. They reported that 66% were still enrolled after one year, but that only 38.1% were either still enrolled or had graduated after two years. Elliot (cited in House, 1989) reported that most transfers who withdrew from the senior institution left at the end of the first semester after transfer (p. 144).

In 1980, Pascarella, Smart, et al. (1986) surveyed 825 students (418 men and 407 women) who began their higher education at 85 two-year institutions in the fall of 1971. In this sample, 53% of the students completed their baccalaureate degrees within the nine-year period. An additional 15% of the men were still actively pursuing a degree, as were 17% of the women.

In their study at City University of New York, Alba and Lavin (1981) reported that initial placement in a two-year college moderately decreased a student's chances of earning a baccalaureate. After controlling for a variety of prematriculation characteristics, the researchers found that students who enrolled initially in four-year institutions received 11.2% more baccalaureate degrees within five years. Avakian, MacKinney, and Allen (1982) also found retention rates to be lower for transfer students than for students who began their college careers at a four-year institution.

In a study of students included in the National Longitudinal Study of the High School Class of 1972 (NLS-72), Velez (1985) found that, after seven years, only 31% of the students who started in academic programs in two-year colleges had attained the baccalaureate, whereas 79% of the students who began in four-year institutions had completed degree requirements. Even after Velez controlled statistically for gender, ethnicity, residence, socioeconomic status, high school background, degree aspirations, and college grades, he found that students who began their higher education at four-year institutions were 18.7% more likely to attain the baccalaureate within seven years.

Holahan, Green, and Kelley (1983) conducted a six-year longitudinal study to compare the rates of degree attainment for native students and transfers. In general, they discovered that transfer students graduated at rates similar to those of the native students.

Anglin et al. (1995) also conducted a comparative study and found the graduation rate for community college transfers to be equal to, or better than, a matched group of native students. However, Holahan et al. found that community college transfers had lower graduation rates than transfers from other senior institutions. In the study, they also discovered statistically significant differences in graduation rates among students from different ethnic groups. Among native students, a greater percentage of Whites (59.6%) and Mexican Americans (56.4%) graduated during the six years than Blacks (36.4%). Among community college transfers, a greater proportion of Mexican Americans (69%) graduated than Whites (56.5%) or Blacks (21.4%). For both native and transfer students, men were more likely to graduate than women, although, in general, women earned higher grade point averages.

Although some authors have reported similar retention rates for transfers and native students, multiple other studies have supported the claim that students who initially enroll in two-year institutions are less likely to persist and attain the baccalaureate than those who enroll initially in a four-year institution (Alba & Lavin, 1981; E. F. Anderson, 1984, 1987; K. L. Anderson, 1981, 1986; Astin, 1982; Brint & Karabel, 1989; Crook & Lavin, 1989; Dougherty, 1987, 1991, 1992; Johnson, 1987; Kinnick & Kempner, 1988; Kohen, Nestel, & Karmas, 1978; B. Levin & Clowes, 1980; Pascarella, Smart, et al., 1986; Pascarella & Terenzini, 1991; Robertshaw & Wolfle, 1983; Temple & Polk, 1986; Thomas & Gordon, 1983; Velez, 1985; Walleri, 1990). Pascarella, Smart, et al., however, offered a word of caution regarding these findings by noting that "beyond the fact that students who begin college in two-year institutions are significantly less likely to persist in higher education or to obtain the bachelor's degree than students who start at four-year institutions . . . . we know little or nothing about the factors that influence the persistence/withdrawal behavior of this important group of students" (p. 48).

Academic performance of community college transfers. A number of researchers have focused on the academic performance of community college students after their transfer to senior institutions. Most authors have found consistent results, particularly with respect to grade point averages earned by transfer students during their first quarter, semester, or year at the senior institutions (House, 1989). They have noted the occurrence of "transfer shock" (a term coined by Hills in 1965) when students have moved from community colleges into senior institutions (e.g., Cohen & Brawer, 1982; Hills, 1965; Holahan et al., 1983; Hughes & Graham, 1992; Kintzer & Wattenbarger, 1985; Kissler, Lara, & Cardinal, 1981; Knoell & Medsker, 1965; Lara, 1981; Zimmerman, 1981). Transfer shock has been characterized by a decrease in grade point average among community college transfers during their first or second term at the senior institution (Hills; Knoell & Medsker; Young, 1982).

Researchers began to study the phenomenon of transfer shock around 1927 (Eells, cited in Diaz, 1992, p. 280), and they have conducted numerous studies since community colleges have become an integral part of postsecondary education. In 1965, Hills examined transfer studies that had been conducted from 1928 through 1964. A review of eight studies led him to conclude that junior college students tended to suffer a significant decline in grade point averages when they transferred. A review of an additional 20 studies supplying 46 sets of data revealed that 44 of the data sets indicated transfer shock whereas two sets indicated no transfer shock. Nickens (cited in Diaz, p. 280) reported a case of "transfer ecstasy" instead of transfer shock; the transfer students experienced an increase in grade point averages after transfer.

According to Hills (1965), one study conducted during the late 1950s at Georgia Southwestern College reported that 69% of the students experienced transfer shock. In a landmark study, Knoell and Medsker (1965) examined the academic performance of 7,243 students who transferred from 345 two-year institutions to 41 senior institutions. They discovered an overall average decline in grade point average of 0.3 points during the first term after transfer. Administrators from all twelve of the surveyed colleges reported that students experienced transfer shock at their institutions.

For an eight-year period, Doucette and Teeter (1985) tracked transfer students from 19 public community colleges to six State universities in Kansas. The community college transfers experienced an average decline of 0.3 in their grade point averages during the first semester at the universities. Using data collected for a single semester on students transferring from two-year to four-year institutions within the Georgia university system, Pounds and Anderson (1989) found an average grade point average decline of .08. In a study of 247 community college transfer students who entered a major Midwestern research university, Hughes and Graham (1992) reported that almost 42% of the students did not achieve a 2.0 grade point average or dropped out prior to the end of the first semester.

Diaz (1992) conducted a meta-analysis of 62 studies that dealt with transfer shock and that reported the magnitude of change in grade point average from the final term at the community college to the end of the first term at the senior institution. Thirteen of the studies showed that transfer students generally did not experience a decline in grade point average. However, the analysis revealed that students in 49 (79%) of the studies experienced transfer shock; the decline tended to be one-half grade point or less.

In a review of studies conducted on transfer shock in the last decade, Cejda (1994) found that most of the research focused on the amount of transfer shock experienced by specific transfer populations, including those who transferred from a specific two-year college, those who entered a single senior institution, or those who entered a public university in a given state. Cejda discovered that some authors based their findings on data collected for just one semester, whereas others based their findings on longitudinal data collected over a three- to eight-year period. Across the studies, researchers defined transfers to include students who had completed between 6 and 64 hours prior to transfer. With only one exception, researchers analyzed data for the total transfer population rather than by major or discipline. Among the studies Cejda reviewed, the common finding was that groups of students transferring from two- to four-year institutions did experience a drop in grade point average during the first semester. However, questions remained because of the differences in subject selection and data collection.

Webb (1985) was the one researcher Cejda found who examined transfer shock by major. Webb tracked the first semester progress of transfer students from a California community college into two senior institutions and discovered that students with higher community college grade point averages experienced less transfer shock. Also, students majoring in mathematics and the sciences experienced the greatest transfer shock.

Hills (1965) reported that transfer students' grades often recovered to some extent In his analysis, he found evidence of recovery from transfer shock in 34 out of 38 studies. Kintzer and Richardson (1986) stressed that, since Knoell and Medsker (1965) conducted their research, most studies have revealed a recovery in grade point average after the initial decline. In the meta-analysis of 62 studies on transfer shock, Diaz (1992) found that 34% of the studies reported that community college transfer students recovered completely from transfer shock, 34% reported nearly complete recovery, and 32% reported partial recovery. In a study of 2,881 community college students who transferred to a large Midwestern four-year institution in the fall of 1980 or 1981, House (1989) found that, although the students experienced a decline in grade point averages immediately after transfer, the grade point averages of continuing transfer students rose after the first semester to regain equality with the grade point average performance of continuing native students.

Although some researchers have claimed that transfers' upper-division grades soon recovered from transfer shock, they often have based their claims on a comparison of a mean grade point average for a group of students who transferred two or three years prior to the study with a mean grade point average for a group of recent transfers. These kinds of analyses have been misleading because many of the transfers from the first group who experienced transfer shock may have withdrawn and would no longer be counted in the study (Dougherty, 1987).

Researchers have examined the academic performance and retention of transfer students not only from a descriptive perspective, but also from a comparative perspective.

In comparing the academic performance of transfer and native students. Kissler et al. (1981) and Lara (1981) found that community college transfer students did not perform as well as native students. However. Stark and Bateman (1981) found only minor differences between the grade point averages of community college transfer students and native students. Richardson and Doucette (1980) found no differences when they considered aptitude test scores, high school class rank, and number of credit hours completed prior to transfer.

Al-Sunbul (1987) investigated the academic achievement (as measured by grade point average and ACT composite scores) of 60 native students and 60 transfer students at the University of Nebraska-Lincoln. Al-Sunbul discovered no significant difference in achievement between native and transfer students. Graham and Dallam (1986) contrasted transfer students with native students by using academic probation as a measure of scholastic performance and found that transfer students from both 4-year institutions and community colleges were more likely to end up on academic probation than were native students. House (1989) examined academic performance based on when the students transferred during their academic careers. Students who transferred as sophomores had grade point averages .25 lower than native students, whereas transfer students entering as juniors had grade point averages only .11 lower than native students.

When Cohen and Brawer (1982) compared both grade point averages and attrition rates, they found that community college transfer students had lower grade point averages and higher attrition rates than native students. Hills (1965) and Knoell and Medsker (1965) discovered that, although transfer students tended to recover from transfer shock, they still had upper-division cumulative grade point averages that were lower than those of native students. These transfer students also exhibited higher attrition rates and demonstrated slower progress toward graduation than the upper-division native students to whom they were compared.

Other factors associated with transfer persistence and degree attainment. Many researchers have examined student characteristics and background educational experiences in an effort to discover plausible associations with transfer student success. Others have focused on the academic, institutional, and social challenges and barriers encountered by students making the transition from the community college setting to the senior institution.

In a study of transfer students into a large southwestern university, Holahan et al. (1983) found that men were more likely than women to graduate in six years from the point of transfer. However, these women earned a higher grade point average than the men. Al-Sunbul (1987) recorded no significant impact on transfer students' achievement from age, high school quartile, transfer grade point average, ACT score, level at time of transfer, high school location, or year in college. However, the author did find gender to be significant: Female transfer students achieved significantly higher than male transfer students.

Jones and Lee (1992), in their study of community college transfers from Los Rios Community College to the University of California at Davis and to California State University in Sacramento, found that community college grade point averages (in 1983-1989) were generally higher for women than for men, for Asians and Whites than for other ethnic groups, for older than for younger students, and for nonremedial than for remedial cohorts of students. At the university level, performance as measured by grade point average followed essentially the same pattern. With respect to baccalaureate degree attainment, by fall, 1989, a lower proportion of women than men had received degrees at the University of California at Davis, but a higher proportion of women had received degrees at California State University at Sacramento.

In their early 1964 study, Knoell and Medsker (cited in Ackermann, 1991) reported that the major reasons junior-level transfers did not graduate within three years were part-time enrollment, low cumulative grade point averages, and changes in degree choice. The transfers who withdrew before degree completion also entered the junior year with a lower community college grade point average than the students who remained enrolled or graduated. Other factors related to transfer student performance in this study included gender, high school achievement, community college achievement, choice of major, and the match between an institution's academic demands and the student's prior achievement and ability (pp. 212-213).

Hughes and Graham (1992) studied 267 traditional-aged community college students who transferred into a large research university. During an early study of this sample, the authors compared community college students who achieved a grade point average of at least a 2.0 in the first semester after transfer with those who did not. They discovered that the students did not differ significantly based on age, gender, parents' educational background, previous high school coursework, educational aspirations, attitudes about interactions with community college faculty and advising staff, family support they received, or type of financial aid they planned to use. The only statistically significant variation was associated with how many classes the students typically missed.

In a later study of the same students, Graham and Hughes (1994) found that where the students planned to live while attending the senior institution, if they had sought faculty assistance outside of class at the community college, and the grade point averages they expected to receive were useful variables in predicting transfer student academic performance. They also discovered that those students with higher transfer grade point averages and who had completed Associate in Arts degree requirements tended to have higher university grade point averages. Overall, Graham and Hughes found that transfer grade point average, intended place of residence, expected grade point average, and the receipt of the Associate in Arts degree accounted for approximately 23% of the variance in first semester grade point average at the university. For fourth-semester grade point average at the university, expected grade point average, transfer grade point average, and receipt of the Associate in Arts degree had predictive value, accounting for 33% of the variance in the equation.

In a study conducted of Northern Illinois University students who transferred from Triton College, McNerney, Knight, Ropiak, Jacot, Gonsiewski, and Mayer (cited in Townsend, McNerny, & Arnold, 1993) found that students who transferred with a grade point average of less than 2.5 were less apt to graduate than those who transferred with a higher grade point average. House (1989) found that community college transfer students classified as juniors demonstrated significantly lower dismissal rates and higher graduation rates than students who transferred as freshmen or sophomores. Because the juniors experienced less transfer shock than those students who transferred as freshmen or sophomores. House suggested that the higher first-semester grade point averages might have been related to higher graduation rates, citing other studies conducted by Bean and Peng and Fetters (p. 146).

Although they interviewed only a small number of community college transfers who graduated from baccalaureate programs, Kinnick and Kempner (1988) reported that the "successful" students tended to have had a high socioeconomic status and a high grade point average in high school. They completed college preparatory programs, had clear goals when they entered community college, and were more involved while at the community college. Phlegar, Andrew, and McLaughlin (1981) found that transfer students who met the senior institutions' core requirements in math, science, and English attained grade point averages 0.2 to 0.4 points higher than transfers who did not have this background.

Townsend et al. (1993) conducted a study of 74 students who transferred from a suburban community college to a private, moderately selective urban university. They found that the best predictors of grade point average at the university were community college grade point average and a College Aptitude Rating score that was a combination of high school class rank and percentile on a college entrance examination. However, it should be noted that these researchers used only "easily ascertainable student characteristics and academic behaviors," possibly missing some other important factors that might have influenced student performance.

In general, authors have concurred that some of the potential obstacles include students' lack of adequate academic preparation (Dougherty, 1987; Townsend et al., 1993); complex and rigid admission procedures (Castillo, 1984; Pascarella & Terenzini, 1991); students' perceived lack of help in the transfer process (Townsend, 1993); discrepancies and variance in the transfer of course credit (Cohen & Brawer, 1989; Dougherty, 1987; Hatfield & Stewart, 1988; Hendel, Teal, & Benjamin, 1984; Peterson & Bailey, 1986; Remley & Stripling, 1983; Rendón & Matthews, 1989; Richardson & Bender, 1987; Swift, 1986; Townsend et al.); changes in grading practices and academic expectations from the junior to the senior institution (Richardson & Bender); students' adjustment to the new environment, which can frequently be a large, senior institution (Diaz, 1992; Rendón & Nora, 1987); and the lack of financial resources (Castillo; Townsend).

Pincus and DeCamp (1989) conducted telephone interviews with 24 matched pairs of academically well qualified minority transfer students, 24 of whom had attained the baccalaureate degree and 24 of whom had not. The researchers matched students based on gender, race/ethnicity, parents' education and occupation, age, and community college major. The students who attained the baccalaureate degree had stronger high school backgrounds, were more likely to have perceived their community college instructors and counselors as helpful, and were less likely to have lost credits when they transferred.

In general, community college transfers have more difficulty obtaining financial aid than native students. In the National Longitudinal Study of 1972, researchers determined that community college transfers received less financial aid, particularly in the form of scholarships and grants, than other students (Dougherty, 1987). Knoell and Medsker (1965) reported that transfer students who drop out of college usually indicate that a lack of money is the primary reason for their decision. Dougherty suggested that the lack of financial aid often causes students to drop out because it forces them to take jobs, which also interfere with their social and academic integration into the four-year institution.

Many other researchers also have reported that transfer students experience difficulty becoming academically and socially integrated into the senior institution. Johnson (1987) found, when she surveyed 271 White, full-time, community college transfer students who registered in the fall semester of 1984 at a large, urban, commuter university in the Southwest, that "community college transfer students' persistence at the university was influenced by their intent to return, academic performance, academic satisfaction, academic integration, and perceptions of the practical value of the academic program" (p. 323). Kissler et al. (1981) conducted a study of community college students who transferred into the University of California at Los Angeles (UCLA). They found that those transfers who dropped out were less socially integrated than their peers, and were significantly more likely to have most of their friends outside UCLA.

Dougherty (1987) reported that many transfer students find it harder than native students to integrate themselves socially because more of them need to work and they feel more pressure to get good grades to validate their admission to the university. Dougherty also pointed out that many senior institutions lack sufficient orientation programs designed specifically for transfer students, many clubs focus their recruitment on freshmen, and many other extracurricular activities are designed with freshmen in mind.

Pascarella, Smart, et al. (1986) applied Tinto's model of persistence/withdrawal to 825 transfer students (418 men and 407 women) surveyed as a part of the 1971-1980 Cooperative Institutional Research Program (CIRP). These students began their higher education at two-year institutions. The researchers found that academic and social integration at the four-year institution each had a significant positive direct effect on persistence and degree attainment for both men and women. For men, direct effects on degree completion also were noted from satisfaction with the last institution attended, high school grades, and high school class rank. Variables reported as having an indirect effect on men's persistence and graduation included secondary school academic achievement and social achievement, college social integration as indicated by involvement with peers and faculty, and college academic integration as indicated by undergraduate grades and membership in an honorary society. For women, secondary school academic achievement had both a direct and an indirect effect on persistence and graduation.

In Johnson's (1987) transfer student model, the perceived practical value of the baccalaureate degree, external factors, academic satisfaction, and academic performance variables were positively associated with students' intent to persist in college. Students' intent to persist was significantly related to actual persistence. Practical value had the greatest association with academic satisfaction. Academic integration also had a significant association with academic satisfaction and academic performance. Therefore, Johnson concluded that the study confirmed the significant influence of the academic domain on transfer student persistence.

Critical Analysis and Summary

As more students have begun their college careers in junior and community colleges, the number of students transferring into senior institutions has risen, too. Although many people have argued that public community colleges increase student access to postsecondary education, transfer students often have lower retention and graduation rates than those students who begin their postsecondary careers at four-year colleges and universities. Therefore, professionals in higher education, as well as legislators and the general public, have become increasingly concerned about the transfer function of community colleges, their articulation with senior institutions, and the subsequent success or failure of transfer students in obtaining baccalaureate degrees.

Baccalaureate degree completion is dependent upon students' academic performance and persistence. Additionally, policy makers often measure educational attainment by students' fulfillment of all degree requirements within a specified time. Therefore, many researchers have focused their investigations on the three intermediate outcomes of students' performance, persistence, and timely progression toward the fulfillment of degree requirements.

In the review of related literature, several notable themes emerged. Most authors described student persistence and educational attainment as longitudinal processes. The theoretical models and empirical results revealed that each student's undergraduate attainment is affected by a complex combination of factors, including the student's own attributes, academic background, skills, and commitments to particular educational goals. Additionally, a student's attainment is influenced by how well that student makes the transition into the new environment, adjusts to the new intellectual demands, and integrates into the institution's social and academic communities.

Researchers have discovered that it is important to differentiate among types of student departure from college–that is, to clearly identify those students who are dismissed for academic reasons versus those who have left voluntarily; to account for students who have merely interrupted their college careers; and to distinguish between student departure from individual institutions and withdrawal from the system of higher education as a whole.

The review of literature on undergraduate educational attainment revealed that researchers have chosen many different variables to represent the theoretical constructs of individual attributes, educational background, institutional characteristics, transition and adjustment factors, academic and social integration, academic performance, timely progression, and persistence. Although studies have continued to produce mixed results, various researchers have been able to discern a number of significant differences among groups of students (identified by such demographic characteristics as gender, ethnicity, and age) in various institutional settings (classified by size, selectivity, and predominant ethnicity of students) relative to their patterns of undergraduate performance, persistence, and degree attainment.

Authors often have cited past academic achievement as a predictor of persistence or attrition. For instance, researchers have found that, among transfers, the existence and magnitude of transfer shock can influence persistence. Some investigators have discovered that the continuity of students' educational experiences can influence degree attainment: Delays in entering college, part-time attendance, interruptions in attendance, and transfer among degree majors or among institutions can have a negative effect on student persistence and graduation. Additionally, the types of support provided for students can have an effect. For example, orientation and other support services can assist students with the transition into a new institution. The impact of student financial aid on persistence has been somewhat unclear, but the majority of the research surveyed for this review indicated that, for the general student population, financial aid had a positive impact.

A number of design and measurement deficiencies have limited much of the current knowledge related to student persistence and educational attainment. Among the issues demanding attention are the need for adequate operational definitions of withdrawal and persistence, the need for valid theoretical models, the need to select appropriate variables and to design adequate ways to measure them, and the need to develop careful designs to carry out data collection and data analyses (Ewell & Jones, 1991).

Several researchers have offered suggestions regarding methods to be used for studying student performance and persistence. They have recommended that subjects be selected from a single cohort of students entering during the same term. Most scholars in higher education now agree that the most meaningful research on undergraduate educational attainment more effectively incorporates longitudinal, multi-institutional, student-level data in order to track stop-outs and transfers, as well as dropouts, students who remain enrolled, and graduates (American Association of Community and Junior Colleges, 1992; Astin, 1993). Many theorists have recommended that researchers move beyond the analysis of aggregate data and examine graduates, students who remain enrolled, and nonpersisters through the utilization of sophisticated statistical tools to analyze possible variables related to the attrition problem.

Some of the most frequently cited determinants of persistence and degree attainment among traditional native students at four-years institutions may have little, or at least a different kind of, relevance for transfer students. The few examinations that relate the aforementioned variables to baccalaureate degree attainment for transfers have remained equivocal about such relationships.

Essentially, although the research has suggested that transfers differ from their native counterparts, educators still know little about the factors associated with community college transfer academic performance, persistence, and baccalaureate degree attainment. Usually, researchers have not differentiated among transfer students based on class level or hours earned prior to transfer. Few investigations have focused on transfers who have already attained their Associate in Arts degrees. In particular, few researchers have examined the differences among the AA transfer students who have been retained to graduation and those who have either withdrawn, transferred, or been dismissed for academic or other reasons.

Therefore, higher education professionals need to examine the persistence and educational attainment patterns of AA transfers to gain a better understanding of why some AA transfers do not perform as well at the senior institutions, do not persist, and do not fulfill degree requirements within a specified time. Additionally, educators will benefit from a model that assists with identifying those AA transfers who are most at risk of not persisting to baccalaureate degree completion. A conceptual framework and methodologies for examining these AA transfer persistence and educational attainment patterns are presented in the succeeding two chapters.

CHAPTER 3

CONCEPTUAL FRAMEWORK AND RESEARCH QUESTIONS

Introduction

Based on the review of relevant literature, a conceptual framework was established that provided the focus for this investigation of AA transfer educational attainment. This chapter presents definitions for key terms in this study, delineates specific questions that guided the research, and explains assumptions and limitations of the study.

Restatement of the Purpose

One purpose of this study was to increase understanding of the undergraduate educational attainment patterns of AA transfers. This goal was accomplished by examining the relationship of selected variables to the academic performance, persistence, and baccalaureate degree completion for these students. The selected variables represented demographic, academic background, institutional, transition, and integration factors. A second goal was to define a model that, using only data available at the State University System level, could correctly classify AA transfers as graduates, students who remained enrolled at the end of the investigation period, nonpersisters who left the System in good academic standing, or nonpersisters who left the System not in good academic standing.

Conceptual Framework

This study emanated from the theoretical base of Van Gennep's (see Tinto, 1987, 1988) work regarding "rites of passage" and various theorists' subsequent work related to student adjustment to college, transitional trauma, and student persistence and educational attainment (Astin, 1977, 1984; Bean, 1982; Bean and Metzner, 1985; Bennett & Okinaka, 1990; Pascarella, 1980; Pascarella & Terenzini, 1991; Spady, 1970, 1971; Tinto, 1975, 1987, 1988). Theoretical models and empirical results have revealed that, for traditional students who begin their college careers at four-year institutions, persistence and undergraduate attainment are affected by a complex combination of factors, including the students' own attributes, academic backgrounds, aspirations, intentions, skills, and commitments to particular educational goals. Additionally, attainment is influenced by how well these students make the transition into the new environment, adjust to the new intellectual demands, and integrate into the institution's social and academic communities.

Transfer students who have earned the Associate in Arts degree already have demonstrated the ability to make the transition from high school to postsecondary education, and they have become sufficiently integrated into the community college to persist to initial degree attainment. However, transfer students are faced with another transition when they enter a senior institution. The university often differs from the community college in size, location, difficulty of the curriculum, and competition among students. Therefore, it is assumed that the AA transfers' next level of educational attainment is dependent not only upon their own individual attributes and pre-university academic backgrounds, but also upon their ability to make the transition into this new environment, adapt to new intellectual challenges, and become integrated, particularly into the academic community that may vary substantially from the one they knew at the community college.

Community college students who already have attained an Associate in Arts degree and enrolled in a university have demonstrated, to some extent, their academic ability and their intention and commitment to attain the baccalaureate. However, as proposed in the Spady (1970), Tinto (1975, 1987, 1988), and Pascarella (1980) models, whether a given student reaches that goal is somewhat dependent upon the degree to which there exists a good match between that student and the university. Additionally, because persistence is a longitudinal process necessary for educational attainment, students' ongoing integration into the academic community is important. Interruptions in enrollment and transfer among majors or institutions can serve as barriers to a student's integration and completion of baccalaureate requirements.

The conceptual framework for this investigation was both student-centered and System-centered. The study focused on the academic experiences of individual students within the chosen cohorts. However, the research also maintained an organizational perspective; that is, students were considered nonpersisters only if they left the form of higher education under the jurisdiction of the organization–in this case, the State University System. Therefore, if students transferred from one institution to another, but remained within the System, they were considered as persisters. Although nonpersisters may have continued their higher education at a private institution or in another state, they were not, for this study, considered "successes" from the perspective of the State University System.

This study was designed with the assumption that educators can clarify why some AA transfers persist to attain the baccalaureate degree within a specified time, whereas others do not. This goal was accomplished partially by identifying variables related to the intermediate outcomes of acceptable academic performance, persistence, and timely completion of degree requirements for this population of students. Now, university personnel can serve this clientele more effectively by designing responses appropriate to those variables found to relate to nonpersistence among AA transfers.

Definition of Terms

For this study, key terms were defined as follows:

1. Associate in Arts degree: an award conferred upon a student for the successful completion of a given lower-division degree program that consists of courses classified in the Florida Community College Management Information System as advanced and professional courses.

2. AA transfer: a baccalaureate degree-seeking student who attained an Associate in Arts degree from one of Florida's twenty-eight public community colleges and who transferred into one of Florida's nine public universities for the first time during the 1991- 1992 academic year.

3. Baccalaureate degree: an award conferred upon a student for the successful completion of a given Bachelor's of Art, Science, or Fine Arts, or other bachelor's degree program.

4. Graduate: an AA transfer, as defined above, who was awarded the baccalaureate degree from the State University System of Florida prior to June 30, 1995.

5. Student who remained enrolled: an AA transfer, as defined above, who was still enrolled in the State University System of Florida as of June 30, 1995.

6. Persister: an AA transfer, as defined above, who either had graduated from or remained enrolled in the State University System of Florida as of June 30, 1995.

7. Nonpersister: an AA transfer, as defined above, who did not graduate from and was no longer enrolled in the State University System of Florida as of June 30, 1995.

8. Student in good standing: an AA transfer, as defined above, who either withdrew from, graduated from, or remained enrolled in the State University System with a cumulative grade point average (university credits only) greater than or equal to 2.0 on a 0-to-4 scale.

9. Degree completion or degree attainment: the fulfillment of all program and curricular requirements for at least a baccalaureate degree from the State University System within the specified time frame.

10. Discriminating variables/predictors: independent variables that were considered in the development of the logistic regression models and the development of a predictive discriminant analysis model. They included the individual attributes, pre-university schooling variables, student transition variables, and academic integration variables listed below, as well as a variable that measured the overall amount of financial aid a student received while enrolled in the State University System during the time of the study.

11. Background variables or individual attributes: variables consisting of demographic attributes including a student's gender, race/ethnicity, and birth year.

12. Pre-university schooling variables: variables consisting of a student's grade point average prior to transfer and the time gap between prior postsecondary enrollment and entry into the State University System.

13. Student transition variables: variables consisting of measures related to the AA transfer's environment and experience during the first semester in the State University System. These variables included the student's cohort status (fall entrant versus spring entrant), number of hours enrolled during the first semester, amount of financial aid received during first semester, and various institutional characteristics of the first university attended.

14. Academic integration variables: variables consisting of measures of the amount of change in grade point average experienced by a student during the first semester at the university, the number of degree major changes, and the number of institutional transfers within the State University System during the time of the study.

15. Black: a student having origins in any of the Black racial groups of Africa (except those of Hispanic origin).

16. White: a student having origins in any of the original peoples of Europe, North Africa, or the Middle East (except those of Hispanic origin).

17. Hispanic: a student of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.

18. Other ethnicity: a student not classified as Black, White, or Hispanic, as previously defined.

19. Adult student: a student who was born in or before 1965 (older than 25 at the time of enrollment in the State University System).

20. A traditional-age student: a student who was born after 1965 (usually 25 years old or younger at the time of enrollment in the State University System).

21. College GPA: the grade point average, based on a 4.0 system, from the previous postsecondary institution and upon which the student's application was evaluated.

22. Transfer hours: the total number of credit hours awarded the AA transfer at another institution and accepted at the university.

23. Time gap: the number of months between the student's prior postsecondary enrollment and entry into the State University System of Florida.

24. Commitment: For this study, the objective evidence of commitment to earn the baccalaureate consisted of actual enrollment in a State university. Because all members of the cohorts under investigation met this criterion, commitment was not included as a predictor variable.

25. Fall entrant: an AA transfer student either who entered the State University System for the first time in the summer of 1991 and continued into the fall of 1991 or who entered for the first time in the fall of 1991. This definition was chosen to match the conventional definition utilized by the State University System and by the National Center for Educational Statistics.

26. Spring entrant: an AA transfer student who entered the State University System for the first time in the spring of 1992.

27. Full-time student: a student enrolled for 12 or more credit hours during the first semester in the State University System.

28. Part-time student: a student enrolled for fewer than 12 credit hours during the first semester in the State University System.

29. Institutional characteristics: variables consisting of the size and selectivity of the first university attended.

30. Size: the Fall 1991 student headcount at the first university attended by a given AA transfer.

31. Selectivity: the average Scholastic Aptitude Test composite score in the 1991-92 academic year at the university first attended by a given AA transfer.

32. First-semester financial aid award: the dollar amount of financial aid awarded to a given AA transfer during the first semester in attendance.

33. First-semester change in grade point average: the difference between an AA transfer's grade point average during the first semester at the senior institution and that student's cumulative grade point average at the community college. Negative values are referred to as transfer shock.

34. Additional financial aid award: the total dollar amount of financial aid awarded to a given AA transfer after the first term of enrollment while enrolled in the State University System during the time of the study.

35. Total number of terms: the number of terms enrolled in the State University System from the summer term of 1991 through June 30, 1995.

36. Cumulative university grade point average: the cumulative university grade point average at the time of graduation; at departure from the System, if not reenrolled; or as of June 30, 1995, if still enrolled.

37. Final classification groups: a polytomous grouping variable that was used in the predictive discriminant analysis model, with the outcome groups of graduates, students who were still enrolled at the end of the investigation period, nonpersisters who left the State University System in good academic standing, and nonpersisters who left not in good standing.

Research Questions

In keeping with the call for accountability in higher education and the theoretical and empirical findings of recent research, five research questions formed the basis for this study. Because educational attainment can be considered, in some respects, a final outcome, three of the research questions addressed the intermediate outcomes of academic performance (academic standing), student persistence, and completion of degree requirements within a specified time.

1. Which of the selected predictor variables were significantly related to the persistence/withdrawal behavior of AA transfers who entered the State University System from the public Community College System? What were the effects of these variables on the probability of student persistence?

2. Which of the selected predictor variables were significantly related to the academic standing, as measured by cumulative grade point average, of AA transfers who entered the State University System from the public Community College System? What were the effects of these variables on the probability of attaining good academic standing at the conclusion of the investigation period?

3. Which of the selected predictor variables were significantly related to baccalaureate degree attainment by June 30, 1995, for AA transfers who entered the State University System in the 1991-92 academic year. What were the effects of these variables on the probability of graduation within the specified time?

4. Based on information that was available at the System level, what differences existed among those AA transfer students who graduated, those who remained enrolled, those who left the System in good academic standing, and those who left not in good academic standing?

5. Could a classification scheme be developed from the discriminating variables used in question 4 that would allow for the correct identification of AA transfer students as (a) students who attained the baccalaureate from the State University System during the specified time, (b) students who remained enrolled in the State University System at the end of the specified time, (c) nonpersisters who left the System in good academic standing (cumulative grade point average ≥ 2.0) and did not return to graduate or to remain enrolled at the end of the study, or (d) nonpersisters who left the System not in good academic standing (cumulative grade point average < 2.0) and did not return to

graduate or to remain enrolled at the end of the investigation?

Assumptions, Limitations, and Other Considerations

There are a number of factors that must be taken into consideration when interpreting the results of this study:

1. It was assumed that the retention and educational attainment patterns of AA transfer students will continue to be of interest to educators and policy makers, particularly in the State of Florida, which has a strong two-plus-two higher education policy.

2. This study was limited to baccalaureate degree-seeking students who transferred from Florida public community colleges after attaining their Associate in Arts degrees.

3. This study was limited to AA transfers who entered the State University System for the first time in the 1991-92 academic year.

4. This study was limited to AA transfer students in the State University System of Florida, consisting of nine operational four-year universities. However, the size and diversity of the group increased the potential of the results to be generalizable to other transfer populations.

5. It was assumed that the 1991-92 cohort of AA transfers was representative of AA transfers who entered or will enter the State University System of Florida in subsequent years.

6. This study examined AA transfer behavior in a State with long-standing articulation agreements between the State's public community colleges and universities. Caution should be taken when making comparisons for students in four-year colleges and

universities that do not have these types of agreements with feeder community colleges.

7. The students included in this study already had demonstrated a certain level of academic achievement through the attainment of the Associate in Arts degree prior to transfer into the State University System. It was assumed that these AA transfers had a substantial commitment to earn the baccalaureate degree, as evidenced by their completion of Associate in Arts degree requirements and subsequent enrollment in the State University System.

8. It was assumed that, in general, the level of support provided for students who entered a university in the fall term probably exceeded the level of support provided for students who initially entered in the spring term. This assumption was based primarily on anecdotal information gathered over a number of years from university personnel and students regarding orientation activities, advising activities, and other support services.

9. This research assessed student behavior from an AA transfer's time of entry into the State University System until June 30, 1995. Therefore, there was a difference in the length of time examined for fall entrants versus the length of time examined for spring entrants. However, the time period for both cohorts exceeded three years, which meets the time-and-a-half criterion established for most retention research.

10. The selection of variables to be included in this investigation was influenced by theoretical and pragmatic considerations. This study was limited to selected background and college academic variables (a) for which data were available in the Admissions File, Financial Aid File, and Student Data Course File of the State University System of Florida; or (b) that could be created from System-level data; and (c) that had been shown

to be of importance in earlier research, especially research related to transfer students.

11. This research did not assess the relationship of personal, psychological, or many environmental variables that might affect students' academic performance, persistence, and progression to graduation. This restriction was not believed to be a detriment to the study because some previous research had implied that these constructs might not be as important in analyses for AA transfers as they would be for residential, native students (e.g., Bean & Metzner, 1985; Johnson, 1987).

12. An underlying assumption of this study was that sufficient levels of correct classification could be obtained using only System-level data. Even if this assumption proved to be inaccurate, the analysis should lead to a greater understanding of how researchers might proceed with additional studies. The benefits of using System-level data included the ready availability of data, the ability to use the entire cohort, the avoidance of the response-rate problems often associated with survey studies, and the reduced costs of conducting the study.

13. The reliability of this study's findings was limited to the reliability of the data in databases maintained by the State University System of Florida.

14. Students who left the State University System and did not return during the investigation period may have returned subsequently to the System and fulfilled degree requirements.

15. Students who left the State University System and did not return during the investigation period may have subsequently enrolled in private or out-of-state institutions and fulfilled degree requirements.

16. Students who were still enrolled in the State University System at the end of the study may have subsequently fulfilled degree requirements within the System or elsewhere.

17. One historical event that may have had an impact on students' behavior in universities in South Florida during the time under investigation was the arrival of Hurricane Andrew in 1992. This disaster has been reported as having a substantial impact on individuals and institutions in the area.

18. Since 1995, there have been a number of Legislative changes that have affected the articulation between the two systems of public higher education in the State of Florida. Future studies will be needed to determine if any of these changes have had a significant impact on AA transfer behavior in Florida.

CHAPTER 4

METHODOLOGY AND COLLECTION OF DATA

Introduction

Presented in this chapter are descriptions of the research setting, the data source, the variables, and an outline of the statistical analyses that were performed. A discussion of the suitability of the statistical procedures chosen for this investigation is provided.

Restatement of the Purpose

The intent of this investigation was to provide a better understanding of AA transfer educational attainment patterns by analyzing multi-institutional data extending over a four-year period. Further, the purpose was to identify a set of variables for which data were available at the State University System level and that, when considered simultaneously, would provide predictive information regarding AA transfer academic performance, persistence, and baccalaureate degree attainment within a specified time.

Research Setting and Population Under Study

The State University System (SUS) of Florida consists of ten institutions, nine of which had students enrolled at the time under investigation. Formally established in 1905, the State University System of Florida is governed by a Board of Regents, consisting of thirteen individuals appointed by the Governor, approved by three members of the Cabinet, and confirmed by the Senate. Additionally, the elected Commissioner of Education serves in an ex officio capacity. The Regents are responsible for appointing a Chancellor, who serves as the chief administrative officer of the Board of Regents and of the State University System (State University System of Florida, 1997).

Florida has twenty-eight public community colleges. Although there is a State Board of Community Colleges (established in 1983) that oversees and coordinates the community colleges, each institution has its own governing board. Twelve of the thirteen State Board of Community College members are appointed by the Governor and confirmed by the Florida Senate. The Commissioner of Education also serves on this Board (Florida Division of Community Colleges, 1997).

The State of Florida has a Legislatively mandated articulation agreement between the two sets of institutions which ensures that students who obtain Associate in Arts degrees from the Community College System are guaranteed placement into the State University System if they so choose (Florida State Board of Community Colleges, 1991). The subjects for this study consisted of two cohorts of Associate in Arts transfers from Florida's public community colleges into Florida's State University System. The fall 1991 cohort consisted of all AA transfer students who entered the State University System in the summer of 1991 and continued their studies in the fall and all AA transfer students who first entered the State University System in the fall of 1991. The spring 1992 cohort consisted of all AA transfer students from Florida's public community colleges who entered the State University System for the first time in the spring of 1992.

These cohort definitions were similar to those used by the State University System and the National Center for Educational Statistics. Included in this study were all of the students from these cohorts for whom sufficient data were available through System-level files.

In the five years prior to this study, approximately 34% of the new students enrolled each fall term in the State University System were AA transfers. Approximately 65% of these AA transfers graduated from the System within four years after entry. Approximately 10% were still enrolled in the System at the end of four years (State University System, 1997).

In the fall semester of 1991, the State University System enrolled 176,077 students altogether (excluding students in special units and students using an employee or senior citizen fee waiver). Of this total population, 94,311 (54%) were reported to be women, and 81,744 (46%) were reported to be men. The full-time headcount was 109,853 (62%), whereas the part-time enrollment was 66,224 (38%). The composition of the student body at the System level included 127,347 (72%) reported Whites, 18,252 (10%) reported Blacks, and 17,992 (10%) reported Hispanics. The System enrolled 128,195 (73%) students in undergraduate programs during this term (State University System of Florida, 1992).

System data indicated that 9,029 AA transfers from the Florida public Community College System entered the State University System for the first time in the fall semester of 1991 (or entered in the summer and continued in the fall), and 3,795 AA transfers entered the System for the first time in the spring semester of 1992 (State University

System, 1992). In this study, the progress of both cohorts of students was followed through the end of the 1994-95 academic year. Degree attainment was defined as the completion of baccalaureate degree requirements by June 30, 1995. Persistence was operationally defined as completing a baccalaureate degree within the specified time or actively working toward the baccalaureate degree within the State University System as of June 30, 1995.

The following groups of students were not included in the study: native first-time-in-college students, students who did not complete their Associate in Arts degrees prior to transfer into the State University System, and Associate in Arts transfers from other institutions or cohort years. The 1991-92 AA transfer cohorts were chosen as opposed to earlier cohorts because of concerns regarding how certain data were gathered and entered into the database in earlier years. Also, cohorts were chosen that were not too far removed from the present situation so that results from this investigation would be germane to current policy decisions.

By utilizing the State University System database, I could track individuals through their careers in the System, even if students transferred from one university to another. However, I did not try to track students who might have transferred to private institutions or to out-of-state institutions. Additionally, given the time constraints of this study, I made no effort to track students beyond the 1994-95 academic year to determine if students who left the System returned or will return, or if students completed or will complete the baccalaureate after the designated time. (Other studies [e.g., Astin, Tsui, & Avalos, 1996] have shown that undergraduate degree attainment rates increase little after the sixth year, and it has become the convention in retention research to follow students for one and one-half times the expected time limit. Most of the AA transfers in this study had been enrolled for at least two years prior to entry into the State University System.)

Data Source and Development of the Data File

The source of data for this study was information contained in the Admissions File, Financial Aid File, and Student Data Course File of the State University System of Florida. The subjects considered for inclusion in this study consisted of the 12,824 AA transfers from Florida's public community colleges who entered the System for the first time during the 1991-92 academic year. Available evidence supported the assumption that this group was representative of AA transfers who would enter the System in later years.

Theoretical and pragmatic concerns influenced the selection of variables that were included in this study; variables were selected based upon theory, previous empirical results, assumed value to university and System personnel, and the availability of data at the System level. The State University System Data Dictionary (State University System of Florida, 1996) was examined to determine which variables matched those (a) that had been found to be significant in other studies, (b) that could be used to construct variables which had been found to be significant in other studies, or (c) regarding which insufficient research had been conducted. It should be noted that, whereas most of the variables chosen had been shown to be significantly related to performance, persistence, or degree attainment in at least one study, no one primary set of variables had been shown to be significant in all, or even most, investigations.

Often, the variables used in retention/attrition studies have included both descriptive information and psychological information, with the latter usually gained from student surveys or interviews. Although the use of psychological variables and other data attained directly from students has contributed to the understanding of student persistence/withdrawal behavior, I chose the more cost- and time-efficient approach of utilizing only System-level data for this study. I assumed that sufficient levels of correct classification could be obtained using only descriptive data and data constructed from existing information. For this particular student population, I also proposed that classifications using available data would surpass correct classifications due to chance, and I assumed that classifications would be similar to levels of correct classifications if psychological data were available. Additionally, by analyzing System-level data, I had the advantage of allowing for the inclusion of entire cohorts and for validation studies on subsequent cohorts, as opposed to being dependent on student response rates on surveys or student participation in interviews.

I constructed the working data file for this study from information in the aforementioned State University System data files. I downloaded this information into Excel for Windows files and then changed it to a format that could be analyzed using the Statistical Package for the Social Sciences (SPSS) for Windows, 7.5/8.0. I reviewed the data, checking them for missing and miscoded information. When possible to determine the correct values from other available data, I entered this information into the file. When unable to determine the correct values for miscoded data (e.g., out-of-range data or data incompatible with other information in the file), I coded these as missing data and proceeded with the analyses. Follow-up analyses of missing data indicated that replacement of missing values with mean values or predicted values gleaned from regression analyses using existing data did not substantially alter the results of this study. Therefore, I decided to conduct the investigation and develop prediction models without including the subjects for whom data were missing.

I included the following variables in the study. I selected these variables because earlier research indicated that many of them were associated with at least one measure of college student performance, persistence, or educational attainment.

Outcome Variables

I developed three logistic regression models with the following outcomes:

1. Persist: This dependent variable (PERSIST) was a dichotomous variable that indicated whether an AA transfer who entered the State University System in the 1991-92 academic year either had graduated from or remained enrolled in the State University System of Florida as of June 30, 1995 (coded as 1), or had not graduated from and was no longer enrolled in the State University System of Florida as of June 30, 1995 (coded as 0).

2. Good standing: This dependent variable (GOODSTDG) was a dichotomous variable that indicated whether an AA transfer who entered the State University System in the 1991-92 academic year withdrew from, graduated from, or remained enrolled in the State University System with a cumulative grade point average (university credits only) greater than or equal to 2.0 on a 0-to-4 scale (coded as 1) or whether the transfer withdrew from or remained enrolled with a cumulative grade point average less than 2.0

(coded as 0). I treated this variable as a binary variable instead of as an interval variable, because university decisions regarding a student's academic standing traditionally are dichotomous in nature, regardless of the student's actual grade point average.

3. Graduate: This dependent variable (GRADUATE) was a dichotomous variable that indicated whether an AA transfer who entered the State University System in the 1991-92 academic year was awarded the baccalaureate degree from the State University System of Florida prior to June 30, 1995 (coded as 1), or was not awarded the degree by this time (coded as 0).

A predictive discriminant analysis model was developed that had one polytomous outcome variable consisting of the following four groups:

1. Graduates: AA transfers (GRADS) who were awarded the baccalaureate degree from the State University System of Florida prior to June 30, 1995.

2. Students who remained enrolled: AA transfers (ENROLLED) who remained enrolled in the State University System of Florida as of June 30, 1995. I did not break this group of students out according to their cumulative grade point average, because I expected the number of enrolled students with a grade point average below 2.0 to be small. Additionally, from an institutional or System-level perspective, these students were still enrolled (even if on academic probation) at the end of the investigation period and might persist to graduation.

3. Nonpersisters in good standing: AA transfers (NPGDSTDG) who did not graduate from and were no longer enrolled in the State University System of Florida as of

June 30, 1995, but who had cumulative grade point averages (university credits only) greater than or equal to 2.0 on a 0-to-4 scale when they left the System.

4. Nonpersisters not in good standing: AA transfers (NPBDSTDG) who did not graduate from and were no longer enrolled in the State University System of Florida as of June 30, 1995, and who had cumulative grade point averages (university credits only) less than 2.0 on a 0-to-4 scale when they left the System. I differentiated students in this category from those in the preceding category because many researchers have found that students who withdraw voluntarily often have quite different reasons for leaving than those students experiencing academic difficulty (e.g., Brigman, Kuh, & Stager, 1982; Noel et al., 1987; Pascarella & Terenzini, 1991).

Discriminating Variables (Predictors)

Below are descriptions of the discriminating variables (predictors) that I assessed for inclusion in each of the three sets of logistic regression models and the predictive discriminant analysis models. The first group of variables that I assessed for inclusion in the models measured individual attributes and demographic characteristics of the AA transfers. In general, student demographic variables have not proven to be extremely useful in predicting persistence and educational attainment, but certain subgroups have tended to have larger percentages of students withdrawing, and, therefore, these variables should be included in statistical analyses (Lenning, 1982).

1. Gender: This discriminating variable (FEMALE) was a dichotomous variable that indicated whether a student was female (coded as 1) or male (coded as 0).

2. Ethnicity: A set of three dummy variables was used to designate a student's race/ethnicity:

a. White: This discriminating variable (WHITE) was a dichotomous variable that indicated whether a student was White (coded as 1) or non-White (coded as 0).

b. Black: This discriminating variable (BLACK) was a dichotomous variable that indicated whether a student was Black (coded as 1) or non-Black (coded as 0).

c. Hispanic: This discriminating variable (HISPANIC) was a dichotomous variable that indicated whether a student was Hispanic (coded as 1) or non-Hispanic (coded as 0).

6. Birth year: This discriminating variable (BRTHYEAR) was treated as an interval variable that indicated the student's year of birth.

Student academic factors have been found to be important in predicting academic dismissals. They often have had an effect in cases of voluntary withdrawal, as well (Lenning, 1982). I took the following measures of pre-university schooling experiences into consideration and assessed them for inclusion in the models:

1. Community college grade point average (grade point average prior to transfer): I used an AA transfer's community college cumulative grade point average (COLLGPA) as an indicator of prior collegiate academic performance. The college grade point average was an interval variable that could range from a low of 0 to a high of 4.

2. Receipt of AA: By definition, all students in the population had obtained the Associate in Arts degree. Therefore, I did not include this variable directly in the models.

3. Time gap: I treated this discriminating variable (TIMEGAP) as an interval variable that was equal to the number of months between the student's last reported attendance in postsecondary education and initial entry into the State University System.

4. Commitment: I assumed that these AA transfers had a substantial commitment to earn the baccalaureate degree, as evidenced by their completion of Associate in Arts degree requirements and subsequent enrollment in the State University System. Therefore, I did not include this variable directly in the models.

5. Transferable hours: All AA transfers transferred at least 60 hours, based on the articulation agreement between the two systems of higher education. Therefore, I did not include this variable directly in the models.

Student transition variables consisted of measures related to institutional characteristics of the first university attended and the AA transfer's experience during the first semester in the State University System:

1. Size: This discriminating variable (LARGE) was a dichotomous variable that indicated whether the student headcount at the first university an AA transfer attended exceeded 15,000 (coded as 1) or was less than 15,000 (coded as 0).

2. Selectivity: I treated this discriminating variable (SELECTIV) as an interval variable that was equal to the average 1991 composite Scholastic Aptitude Test score at the first university an AA transfer attended.

3. Cohort: In compliance with the conventional definitions utilized by the National Center for Educational Statistics, this discriminating variable (FALLENTR) was a dichotomous variable that indicated whether an AA transfer student either entered the

State University System for the first time in the summer of 1991 and continued into the fall of 1991 or entered for the first time in the fall of 1991 (coded as 1), or whether an AA transfer student entered the State University System for the first time in the spring of 1992 (coded as 0).

4. First-term course load: I treated this discriminating variable (COURSLD1) as an interval variable that indicated the total number of hours for which an AA transfer enrolled during the first semester at the university.

5. First-term financial aid: I treated this discriminating variable (FINAID1) as an interval variable that was equal to the dollar amount of financial aid awarded to a given AA transfer during the first semester at the university.

Several measures were related to how well an AA transfer student adjusted and became integrated, particularly from an academic perspective, into an institution in the State University System:

1. First-term change in grade point average: I treated this discriminating variable (GPACHANG) as an interval variable that was equal to the difference in an AA transfer's first-semester grade point average at the senior institution and the cumulative grade point average at the community college. A negative value indicated that a student experienced some degree of transfer shock.

2. Number of degree changes: I treated this discriminating variable (DEGCHNGS) as an interval variable that was equal to the number of times an AA transfer officially requested a change of degree major while in the State University System during the time covered by this investigation.

3. Institutional change: I treated this discriminating variable (INSTCHNG) as a dichotomous variable that was coded as 1 if an AA transfer moved from one institution to another within the State University System during the time covered by this investigation, and was coded as 0 if an AA transfer did not transfer from one institution to another within the State University System during the time of this investigation. (Only one student actually transferred more than once–that is, twice–during the investigation.)

One additional support factor that has received much attention in the educational attainment literature involved overall financial aid support:

1. Additional financial aid award: I treated this discriminating variable (FINAIDAD) as an interval variable that was equal to the total dollar amount of financial aid awarded to a given AA transfer after the first term. Combined with first-term financial aid, this amount was equal to the total dollar amount of financial aid awarded to a given AA transfer while enrolled in the State University System during the time covered by this investigation.

Because academic performance and persistence were necessary conditions for graduation, two additional variables deserved consideration when analyzing overall educational achievement:

1. Cumulative university grade point average: This variable (CUMGPA) was an interval variable that could range from a low of 0 to a high of 4.

2. Total number of terms attended: I treated this discriminating variable (TOTTERMS) as an interval variable that captured the number of terms an AA transfer

was enrolled in the State University System from the summer term of 1991 through June 30, 1995.

Research Questions and Choice of Statistical Analyses

The following questions guided this study:

1. Which of the selected predictor variables were significantly related to the persistence/withdrawal behavior of AA transfers who entered the State University System from the public Community College System? What were the effects of these variables on the probability of student persistence?

I used logistic regression analyses to examine the relationships between predictor variables (related to individual attributes, pre-university schooling, student transition, and academic integration) and AA transfer students' persistence within the State University System. I developed models that utilized selected variables to predict the probability that AA transfers with certain characteristics and experiences persisted within the System to graduation or remained enrolled at the conclusion of the investigation. Because this stage of the study was exploratory in nature, I made an effort to determine which of the available variables would maximize the prediction models.

2. Which of the selected predictor variables were significantly related to the academic standing, as measured by cumulative grade point average, of AA transfers who entered the State University System from the public Community College System? What were the effects of these variables on the probability of a student attaining good academic standing at the conclusion of the investigation period?

Again, I used logistic regression analyses to examine the relationships between predictor variables (related to individual attributes, pre-university schooling, student transition, and academic integration) and AA transfer students' academic standing within the State University System. I developed models that utilized selected variables to predict the probability that AA transfers with certain characteristics and experiences attained a cumulative grade point average greater than or equal to 2.0 by the conclusion of the investigation period. Again, this stage of the study was exploratory in nature, so I attempted to determine which of the available variables would maximize the prediction models.

3. Which of the selected predictor variables were significantly related to baccalaureate degree attainment by June 30, 1995, for AA transfers who entered the State University System in the 1991-92 academic year? What were the effects of these variables on the probability of graduation within the specified time?

This time, I used logistic regression analyses to examine the relationships between predictor variables (related to individual attributes, pre-university schooling, student transition, and academic integration) and AA transfer students' baccalaureate degree attainment from the State University System within the time of the investigation. I developed models that utilized selected variables to predict the probability that AA transfers with certain characteristics and experiences graduated with at least a baccalaureate degree from the System by June 30, 1995. Because this stage of the study was exploratory in nature, I again sought to find a balance between model fit and parsimony.

4. Using information that was available at the System level, what differences existed among those AA transfer students who graduated, those who remained enrolled, those who dropped out in good academic standing, and those who left not in good academic standing?

I ran and analyzed descriptive statistics, broken out by final classification groups. As a part of predictive discriminant analyses, I conducted multivariate analyses of variance (MANOVA) to determine if there were statistically significant overall multivariate differences among the discriminating variables (related to individual attributes, pre-university schooling, student transition, and academic integration) across the four groups of students. When such an overall difference was noted, I continued the analysis and conducted univariate F tests to determine if there were significant differences among the four groups of students for each of the discriminating measures. In those cases where differences were noted, I proceeded to conduct pairwise comparisons to more clearly identify the source of the contrast.

5. Could a classification scheme be developed from the discriminating variables used in question 4 that would allow for the correct identification of AA transfer students as (a) students who attained the baccalaureate from the State University System during the specified time, (b) students who remained enrolled in the State University System at the end of the specified time, (c) nonpersisters who left the System in good academic standing (cumulative grade point average ≥ 2.0) and did not return to graduate or to remain enrolled at the end of the study, or (d) nonpersisters who left the System not in

good academic standing (cumulative grade point average < 2.0) and did not return to graduate or to remain enrolled at the end of the investigation?

I developed predictive discriminant analysis models to explore the extent to which group membership could be predicted from measures of an AA transfer student's prior performance, individual attributes, pre-university academic experiences, initial transition, and integration into the university. Additionally, I determined whether the prediction rates obtained with the models were better than those obtainable by chance. This portion of the investigation was influenced and informed by the exploratory logistic regression analyses of the intermediate outcomes.

I chose this particular combination of statistical procedures for several reasons: Logistic regression and predictive discriminant analyses are suitable choices when the outcomes are categorical in nature. Specifically, logistic regression is an appropriate regression technique when the outcome is dichotomous and the data set includes both continuous and categorical variables (Demaris, 1992; Gujarati, 1992, 1995; Hosmer & Lemeshow, 1989; Norušis, 1994a; Tabachnick & Fidell, 1996; Tate, 1996; Tinto, 1975). Predictive discriminant analysis, with a related multivariate analysis of variance (MANOVA), is an appropriate classification technique when the criterion is a polytomous grouping variable measured on a nominal scale (Huberty, 1994; Klecka, 1980; Norušis, 1994b; Stevens, 1992; Tabachnick & Fidell; Tate, 1996).

AA transfer students in this investigation were members of one of four final mutually exclusive and all-inclusive classification groups: graduates, students who remained enrolled in the State University System at the end of the investigation, nonpersisters who left in good academic standing, or nonpersisters who left not in good academic standing. Because I conducted this study on a post hoc basis, I knew each student's group membership in advance. Although it is possible to conduct logistic regression analyses with polytomous outcomes that have more than two categories, SPSS for Windows 7.5 and 8.0 did not have this capacity. Therefore, even though there were more stringent considerations regarding underlying assumptions for discriminant analysis, I chose to follow up the logistic regression analyses with predictive discriminant analyses and related multivariate analyses of variance. These techniques have the ability both to enhance understanding of the nature of group differences and to develop models to predict final group membership on the basis of the selected discriminating variables (Betz, 1987; Huberty, 1994; Klecka, 1980; Tabachnick & Fidell, 1996).

I refer the reader to Aldrich and Nelson (1984), Gujarati (1992), Hosmer and Lemeshow (1989), Norušis (1994a), Tabachnick and Fidell (1996), and Tate (1996) for a general introduction to logistic regression. The specifics concerning how logistic regression coefficients are estimated, how to address concerns regarding underlying assumptions, and decisions regarding types of logistic regression can be found in many of the aforementioned references, along with writings by Agresti (1990) and Pindyck and Rubinfeld (1981). Introductions to predictive discriminant analysis can be found in the writings of Betz (1987), Huberty (1994), Huberty and Barton (1989), Klecka (1980), Norušis (1994b), Stevens (1992), Tabachnick and Fidell (1996), and Tate (1995).

Statistical Considerations for the Logistic Regression Analyses

For each preliminary logistic regression analysis, I used data from the calibration sample to develop the prediction models, and data from the second group for cross-validation purposes to see how well the estimates of population prediction coefficients generalized to a new sample of cases. Subsequently, I recombined the groups for the development of the final models.

I assessed each model to determine the overall logistic relationship, the effect of individual variables as represented by coefficients and odds ratios, the model goodness of fit, and the model's ability to correctly classify students into appropriate outcome groups. I chose an alpha level of .05 for variable entry into logistic equations, .10 for removal of variables in the backwards stepwise analyses, and .001 (chosen because of the large sample sizes) for tests of overall logistic relationships and model goodness of fit.

Logistic regression assumes that cases are independently distributed and, therefore, that no group effects exist (Tate, 1996). Although the large sample size, the diversity of student backgrounds, and the potential variety of student experiences reduced the possibility of dependence among cases in this investigation, caution was still needed. There still existed the potential for some dependence among students attending the same institution. Logistic regression also is sensitive to extremely high correlations among predictor variables (Tabachnick & Fidell, 1996), so I checked bivariate correlations to minimize problems associated with multicollinearity.

I checked frequencies for the categorical predictor variables, because dichotomous variables with extremely uneven splits between two categories can produce outliers, and because correlation coefficients between these and other variables can be truncated (Rummel, 1970). Tabachnick and Fidell (1996, p. 579) indicated that all expected frequencies should be greater than one, and that no more than 20% should be less than five. Additionally, Rummel suggested deleting dichotomous variables with 90-10 splits between categories, because the scores in the category with fewer than 10% of the cases are more influential than those in the category with more than 90% of the cases.

In logistic regression, goodness of fit refers to how well a model correctly describes the true functional form of the relationship between the probability of an outcome being equal to1 (e.g., persist, attain good academic standing, graduate) and the predictor variables (Tate, 1996, p. 238). A model that provides a good fit is one in which the predicted value of the outcome variable closely resembles the observed value of the outcome variable. I chose to use the Hosmer-Lemeshow (1989, pp. 140-145) goodness-of-fit test statistic, $\hat{C}$, which has a chi-square distribution and computes the difference between the observed and estimated probability frequencies for the outcome variable.

In the logistic regression analyses, a coefficient (β) in a model could be exponentiated (e^{β}) to determine either the change in the odds or the odds ratio itself, depending on whether the particular predictor variable was continuous or dichotomous. The odds ratio for each dichotomous variable was a measure of association that approximated how much more likely or unlikely it was for the outcome to be present among those AA transfers with an independent value equal to 1 rather than 0, once adjustments were made for the linear effects of the other variables in the equation. In general, for the continuous variables, the odds ratio measured the change in odds for a unit change in the variable, controlling for the other variables (e.g., Hosmer & Lemeshow, 1989; Menard, 1995).

However, for some variables, I found it more useful to assess changes other than a unit change. For a change of *c* units for a given predictor variable, the odds ratio was calculated by exponentiating the product of *c* and the model's coefficient for that variable ($e^{c\beta}$) (Tate, 1996, p. 229). Because no established conventions existed in the profession for discussing changes of particular magnitudes, I attempted to choose degrees of change that made some sense based on personal experience and that might lead to easier interpretation. Therefore, for this study, I calculated odds ratios for a change in age of five years, a change in community college grade point average of 0.25, a change in the difference between first-term grade point average and community college grade point average of 0.25, a change in the time gap between previous postsecondary and university enrollment of 12 months, a change in the average composite Scholastic Aptitude Test score of 50 points, a change in a student's first-term course load of three hours, a change in first-term financial aid of $500, and a change in additional financial aid of $1,000.

Readers are cautioned that, for this study, continuous variables all were modeled linearly in the logit and results should be interpreted with this caveat in mind (Hosmer & Lemeshow, 1989; Menard, 1995). For example, the change in the odds of persisting for AA transfers who enrolled for 9 hours during the first term compared with 6 hours would be the same as the change in the odds of persisting for AA transfers who enrolled for 18 hours compared with 15 hours.

For each logistic regression analysis, I conducted an assessment of the practical importance for each of the effects. These assessments were particularly necessary because of the large sample sizes in this investigation. With such large samples, effects often can be statistically significant and yet not be practically important (Tabachnick & Fidell, 1996, Tate, 1996). Again, because I was unable to find many guidelines in the professional literature, I made a somewhat arbitrary decision regarding thresholds for determining practical importance. An odds ratio of 1 reflects no change in the effect when the value of the variable changes. Therefore, I made the judgment that if a statistically significant point estimate for an odds ratio (with the magnitudes of change as specified above) fell between 0.90 and 1.10, then I would not consider the effect to be of practical importance for the sample.

Then, I calculated 95% confidence intervals for each odds ratio in each model. If all of the points within a confidence interval fell between 0.90 and 1.10, then I determined that the population effect was of no practical importance. If an effect was not statistically significant and all values fell within this interval, I was able to go even further and determine that the effect was trivial. If an interval for a statistically significant effect captured no points between 0.90 and 1.10, then I determined that the effect was of practical importance. Finally, if the 95% confidence interval for a statistically significant effect captured points both within and outside of the 0.90 - 1.10 range, then I considered the assessment of practical importance to be inconclusive.

Practical importance depends entirely on the research context, so only the individual actually using the information can judge if an effect is large enough to be considered important (Light, Singer, & Willett, 1990). Other researchers and practitioners may decide to use a different set of threshold values for determining the practical importance of these results for particular situations. I have presented sufficient data in Appendix B for interested individuals to reassess practical importance for each analysis using different decision rules.

For each logistic regression, I also conducted case analyses to determine if any observations exerted excessive influence on the estimated parameters of the model. To accomplish this assessment, I calculated the odds ratio for each sample, using the magnitudes of change outlined above. Then, I calculated the odds ratio for each sample eliminating the most extreme cases, based on minimum and maximum delta betas. Delta betas are case indices that measure the change in the reference coefficient for each predictor variable if a particular observation is removed from the analysis (Tate, 1996, p. 248). Finally, I calculated the ratio of the two odds ratios (without the extreme case/entire sample). Again, because a ratio of 1 reflects no change, I made the judgment that if this ratio fell between 0.90 and 1.10, I would not consider the observation to have exerted excessive influence on the results.

One of my goals was to classify AA transfers as projected persisters or nonpersisters, projected students in good academic standing or not, and projected graduates or nongraduates. Classification was possible with logistic regression because the ultimate results of the regression equations were probabilities. For this particular study, I used decision rules that included a cut score of .75 for the persistence models, .85 for the academic standing models, and .65 for the graduation models. I checked classification rates with these particular cut scores in addition to the traditional cut score of .50 for two reasons: (1) When the goal is to develop prediction models that identify students who are at risk of not "succeeding," a cut-score other than .50 often is more appropriate, even if the overall accurate classification rate is reduced (Menard, 1995). (2) Earlier State University System data for AA transfers in fall cohorts indicated that persistence rates after four years averaged around 75%. Graduation rates lingered around 65% (State University System of Florida, 1997). Finally, a number of researchers have reported that as many as 60-85% of the students who have withdrawn from postsecondary education have done so voluntarily, with many in good academic standing (e.g., Brigman, Kuh, & Stager, 1982; Noel, et al., 1987; Tinto, 1993). Each practitioner must determine which cut rates serve a given purpose best, but for this study, I based my choice of cut rates on these criteria.

The Hosmer-Lemeshow (1989, pp. 140-145) test statistic provided a means by which I could assess which groups of cases were fit well by a given model and which ones were not fit well by the model. The statistic was based upon a table in which estimated probabilities were grouped into ten groups called "deciles of risk." For each decile, the observed and expected frequencies for the outcome variable (i.e., persist or not persist, good standing or not good standing, graduate or not graduate) were computed by adding the logistic probabilities for those students in that decile. For instance, those students in the 1st decile of risk were those AA transfers with the lowest probability of attaining the outcome that had been specified as 1 as opposed to 0. AA transfers in the 10th decile of risk represented those with the greatest predicted probability of attaining the outcome specified as 1. As deciles of risk increased, so did the students' probability of attaining that outcome (i.e., persistence, good standing, graduation).

Finally, I evaluated cases that were not fit well by the final models to determine how these students might differ from the rest of the AA transfer population. I ran descriptive statistics for those cases with studentized residuals less than -2.5 or greater than 2.5 for one or more of the final logistic regression models (Norušis, 1994a).

Statistical Considerations for the Predictive Discriminant Analyses

The final logistic regression models for the intermediate outcomes of persistence, academic standing, and graduation provided a useful lens through which to view the data regarding the educational attainment patterns of AA transfers. However, I also was interested in being able to accurately predict the final classification of AA transfers as graduates, persisters who remained enrolled at the end of the study, nonpersisters who left the System in good academic standing, or nonpersisters who left not in good academic standing. Therefore, I chose to conduct a follow-up set of discriminant analyses on the data.

Predictive discriminant analysis provided a means by which to assess the relative contributions of the predictor variables on this final outcome variable with four levels. The procedure generated a series of linear equations with standardized canonical discriminant function coefficients (beta weights) that indicated the relative importance of each variable in predicting group membership. The weights were mathematically determined to maximize the differences among groups. Therefore, I could use the linear equations to better understand the nature of group differences, as well as for predicting student outcomes (e.g., Betz, 1987; Huberty, 1994; Klecka, 1980; Norušis, 1994b; Stevens, 1992; Tabachnick & Fidell, 1996; Tate, 1995).

Conceptually, this classification scheme was based on the Bayesian probability of group membership, given the data. Probabilities of membership in each of the four groups were computed for each student. A student was then assigned to the group with the largest probability. Prior probabilities and group similarity based on the data for the student were the two elements that were used to determine this posterior Bayesian probability (Tate, 1995).

Ordinarily, one might assume that any student included in the study might have had an a priori equal probability of being in any one classification group (i.e., a 25% chance of being either a graduate, a still-enrolled student, a nonpersister who left in good standing, or a nonpersister who left not in good standing). However, data from earlier years indicated that the actual sample sizes were more representative of the population sizes over time (State University System of Florida, 1997).

Therefore, based on this information and related research, I decided to run one set of analyses with prior probabilities set equal to 65% for graduates, 10% for AA transfers still enrolled at the end of the study period, 15% for students who left the System in good academic standing, and 10% for students who left not in good academic standing. However, several researchers have cautioned against using anything but equal prior probabilities (e.g., Lindeman, Merenda, & Gold and Tatsuoka, cited in Stevens, 1992, p. 293; Terenzini, 1982, p. 68). Because one of my ultimate goals was to achieve accuracy in predictions, I also ran a set of analyses with equal prior probabilities.

Classification function coefficients provided the mechanical, mathematical means of conducting the classification procedures. An individual was classified into one of the groups by calculating the student's linear discriminant score for each group. This process involved taking the student's scores on each of the discriminating variables, multiplying each value by the corresponding classification function coefficient for a specific group, and along with the constant, summing the terms to obtain a single value associated with the linear discriminant function for that group. The same procedure was used to obtain values for the other three groups, and then the student was estimated to be in the group for which that student obtained the highest score. This mechanical placement was equivalent to placing the student into the group for which there was the greatest Bayesian probability–that is, the probability of group membership, given the data. These classification function coefficients also were used to place a new group of students (the cross validation sample) into estimated classification groups (Tate, 1995).

When conducting the predictive discriminant analyses and related multivariate analyses of variance, I had to consider a number of data conditions. Among the mathematical and distributional assumptions inherent in these statistical techniques was the assumption, like with logistic regression, that the observations were independent. Additionally, it was assumed that the continuous variables came from a multivariate normal population for each group and that the within-group variance-covariance matrices

were equal (e.g., Huberty, 1994; Klecka, 1980; Stevens, 1992; Tabachnick & Fidell, 1996; Tate, 1995).

For this study, I assessed univariate normality in an effort to detect possible violations of joint normality. In order to assess whether there were any violations of the homogeneity of variance/covariance matrices assumption, I conducted Box's M multivariate tests for homogeneity of dispersion matrices (Norušis, 1994b, p. 37).

Some authors (e.g., Klecka, 1980) have contended that discriminant analysis should not be used when the predictors include variables that are dichotomous in nature. However, Betz (1987) reported that, although the discriminating variables are usually measured as continuous variables, they sometimes are discrete variables. Huberty (1994) contended that the use of this statistical procedure in models that include binary discriminating variables is appropriate if values for these variables are dummy coded as 0 and 1. Dillon and Goldstein (1984) also discussed methods for handling cases in which some of the discriminating variables were discrete rather than continuous.

Although statisticians had conflicting opinions regarding the use of categorical discriminating variables in predictive discriminant analysis, I decided to proceed. However, I paid careful attention to assessing whether each analysis was robust to violations of assumptions underlying the statistical procedures.

In an effort to evaluate the final classification model, I had to determine how well the selected variables produced a model that contributed useful results. First, I assessed the degree to which the model could classify students used in the calibration sample into the correct original groups. Then, I used the results from the calibration sample to predict the likely attainment outcomes for students in the cross validation sample. Finally, I recombined the calibration and cross-validation samples and ran a discriminant analysis for the entire sample. In each case, I inspected the "hit rates" for correct classification into specific groups and assessed the impact of misclassifications, depending on the purposes for which the model might be used.

CHAPTER 5

MODEL DEVELOPMENT AND RESULTS

Introduction

The theoretical framework developed in the previous chapters is used in this chapter to analyze the educational attainment patterns of AA transfers. The discussion begins with a brief description of all of the AA transfers included in the investigation. In subsequent sections, I discuss the development of logistic regression models to predict the intermediate outcomes of student persistence, academic good standing, and timely graduation from the State University System. Then, I discuss the development of a discriminant analysis model to predict which AA transfers graduated by June 30, 1995, which transfers remained enrolled in the System, which transfers left the System in good academic standing, and which transfers left the System not in good academic standing.

The Subjects of the Research

The subjects I considered for inclusion in this study consisted of the 12,824 students who transferred with the Associate in Arts degree from Florida's public community colleges into Florida's State University System during the 1991-92 academic year. Large sample sizes are preferred for logistic regression analysis because related hypothesis testing is based on maximum likelihood estimates (i.e., the inferential procedures have been derived as "asymptotic theory," Tate, 1996, p. 239). Additionally, predictive discriminant analysis and related MANOVA procedures often are more robust to violations of some assumptions when the sample size is large (Huberty, 1994; Stevens, 1992; Tabachnick & Fidell, 1996). Therefore, I excluded only students for whom critical data were missing. (Follow-up analyses of missing data indicated that replacement of missing values with means or with predicted values gleaned from regression analyses using existing data did not substantially alter the results of this study. Therefore, a decision was made to proceed without the subjects for whom data were missing.)

For each preliminary logistic regression analysis and discriminant analysis, the population was divided randomly into two approximately equal groups. Data from the calibration sample (consisting of 6,004 - 6,006 valid cases per analysis) were used to develop the prediction models, and data from the second group (consisting of 6,057 - 6,063 valid cases) were used for cross-validation purposes to see how well the estimates of population prediction coefficients generalized to a new sample of cases. Subsequently, the groups were recombined for the development of the final models.

I have provided basic descriptive statistics for the entire group of AA transfers in Table 1. Descriptive statistics broken out for the calibration sample and the cross-validation sample have been included in Tables 16 and 17 in Appendix B.

Descriptive Statistics for Intermediate Outcomes

A preliminary review of the data indicated that, of the 12,824 students, 9,731 AA transfers either graduated (8,300) from or were still enrolled (1,431) in the State University System as of June 30, 1995. Of the 3,093 AA transfers who did not persist,

TABLE 1.

Summary of Variable Characteristics for Entire Sample

Variables	Mean	*SD*	Skewness	Kurtosis	Missing
Intermediate Dependent Variables					
Persist	.76	.43	-1.21	-.53	0.02%
Cumulative GPA > 2.0	.89	.32	-2.45	4.02	1.54%
Graduate	.65	.48	-.62	-1.62	0.00%
Predictor Variables					
Gender (Female = 1)	.57	.50	-.27	-1.93	0.00%
Ethnicity					
(White = 1)	.80	.40	-1.48	.18	0.08%
(Black = 1)	.05	.23	3.95	13.61	0.08%
(Hispanic = 1)	.11	.31	2.53	4.38	0.08%
Birth Year	1966.74	6.17	-2.24	5.73	0.03%
Community College GPA	2.95	.49	.08	-.69	1.77%
Enrollment Time Gap (Months)	5.77	16.24	8.17	86.85	0.41%
Institutional Size (More than 15,000 = 1)	.82	.39	-1.66	.74	0.00%
Institutional Selectivity	1030.16	39.87	-.42	.32	0.00%
Cohort Group (Fall = 1)	.70	.46	-.89	-1.20	0.00%
First-Term Load (Hours)	11.01	3.65	-.74	-.08	0.00%
First-Term Financial Aid	358.77	578.87	1.77	3.81	0.00%
First-Term Change in GPA	-.26	.84	-.61	1.01	5.61%
Degree Changes	.56	.77	1.34	1.55	0.00%
Institution Changes (Yes = 1)	.04	.21	4.44	17.75	0.00%
Additional Financial Aid	402.52	871.93	2.25	4.60	0.00%
Cumulative GPA	2.83	.77	-1.10	1.72	1.54%
Total Number of Terms	5.87	2.44	-.08	-.22	0.01%
Valid *N* (Listwise)			(*N* =	12,824)	5.95%

1,212 students (9% of the total) were recorded as having left the System with a grade point average below 2.0 on a 4.0 scale, and 1,697 students (13% of the total) were recorded as having left in good academic standing. Insufficient data were available to determine the academic standing of the remaining 184 students (1%) who left the System.

Correlations among the predictor variables for the entire sample in this study have been provided in Table 15 of Appendix B. The highest correlations were between the categories of ethnicity: White and Black ($r = .74$), White and Hispanic ($r = .82$), and Black and Hispanic ($r = .65$). The correlation between university size and selectivity was -.51, and the correlation between first-term financial aid and additional financial aid was -.34. All other correlations fell between -.30 and .30. For individual analyses, correlations often were smaller.

As mentioned previously, Tabachnick and Fidell (1996, p. 579) indicated that, for logistic regression analyses, all expected frequencies should be greater than one, and that no more than 20% should be less than five. These conditions were met for this investigation. Additionally, Rummel (1970) suggested deleting dichotomous variables with 90-10 splits between categories. In this study, the ratio of non-Black students to Black students was greater than ten to one. However, because other researchers had found race to be an important variable, I chose to retain it, realizing that its association with other variables was deflated because of the extremely uneven split (Tabachnick & Fidell, p. 66). I also decided to keep the ethnicity variable divided into four categories because of the need for more specific information about the Black and Hispanic student populations in the State University System. I believed that reducing the number of racial categories further would result in the loss of valuable information.

Fewer than 10% of the AA transfers changed institutions. I made a decision to include this variable in the analyses because so little prior research has dealt with the effect of transfer among institutions within a specific system of higher education. However, results regarding the effect of this variable should be interpreted with caution. In follow-up analyses without this variable, I noted no major shifts in the models, and models without this variable were only slightly less effective (less than 0.1%) in predicting outcomes. Therefore, other researchers may not want to include this variable unless there are a substantial percentage of students (more than 10%) who transferred from one institution to another within a given system of higher education.

When I examined the intermediate outcomes of persistence, good academic standing, and timely completion of degree requirements (see Table 18 in Appendix B), I discovered that, of the female students chosen for inclusion in the study, more than 76% persisted and 66% graduated within the specified time. On the other hand, approximately 75% of the male AA transfers persisted and 63% graduated. The mean cumulative grade point average for all AA transfers in the study was 2.83 (*SD* = 0.77), with 2.94 (*SD* = 0.74) for females and 2.67 (*SD* = 77) for males. Of the females, 91% ended up in good academic standing, and 85% of the males attained good academic standing.

Breaking these groups down further, I discovered that Black males represented the lowest rates of attainment, with only 70% persisting, 75% in good academic standing, and 50% graduating. The highest rates were obtained by "Other" males, with 78%

persisting; White females, with 92% attaining good academic standing; and "Other" females with 68% graduating. The mean cumulative grade point average for Black males was 2.35 (*SD* = .090), whereas for White females, it was 2.99 (*SD* = 0.72).

Whereas the mean age for AA transfers entering the State University System during the 1991-92 academic year was 25, more than half of the students were 22 or younger. Of the AA transfers who were born after 1965 (approximately 25 years old or younger), 78% persisted, 88% attained good standing, and 68% graduated within the specified time. Of the older students (born in or before 1965), 70% persisted, 92% attained good standing, and 56% graduated. The mean cumulative grade point average for younger AA transfers was 2.75 (*SD* = .075), whereas for older transfers, it was 3.07 (*SD* = 0.78).

"Other" older females (86%) and White and "Other" younger males (both 79%) persisted at the highest rates; older Hispanic males (58%) and females (65%) persisted at the lowest rates. The highest rates for good standing were for older females who were White (95%), "Other" (94%), or Hispanic (93%); the lowest rates were for older (72%) or younger (81%) Black males and for older Hispanic males (81%). As a point of reference, older White females had a mean cumulative grade point average of 3.25 (*SD* = 0.70), older Black males had 2.52 (*SD* = .092), and younger Black males had 2.26 (*SD* = 0.88). "Other" older females (75%) and younger White females (71%) graduated at the highest rates, whereas older Hispanic males (42%) and females (47%) and older Black males (46%) and females (50%) graduated at the lowest rates.

Of the AA transfers who had a cumulative grade point average at the community college below a 2.5, 68% persisted, 77% attained good standing, and 55% graduated. For those with a grade point average between 2.5 and 3.0 upon transfer, 74% persisted, 86% attained good standing, and 62% graduated; and for those with a grade point average between 3.0 and 3.5, 80% persisted, 94% attained good standing, and 70% graduated. Finally, for those with a cumulative grade point average between 3.5 and 4.0 upon entry into the university, 81% persisted, 98% attained good standing, and 72% graduated.

For those students who went ahead and enrolled in the State University System within one year of completing earlier postsecondary studies, 77% persisted, 89% attained good standing, and 67% graduated. On the other hand, of those who waited longer than one year, 61% persisted, 89% attained good standing, and 46% graduated. Of the AA transfers who entered with the fall cohort, 77% persisted, whereas only 73% of those in the spring cohort had graduated or were still enrolled as of June 30, 1995 (even though students in this group started one or two terms later). Of the students in the fall cohort, 89% attained good standing, as did 87% of those in the spring cohort. Finally, 67% of the fall cohort and 58% of the spring cohort graduated by June 30, 1995.

I took this analysis one step further, and looked at patterns relative to the combination of time gap since prior enrollment and cohort groups. Although I noted few differences among the student groups regarding academic standing, I discovered differences regarding persistence and graduation. I found that 78% of the students who entered the university during the fall term and within one year after previous postsecondary enrollment persisted. But for other students entering with the fall cohort who had been out of school for more than one year, the rate was only 63%. For the spring cohort, the rate was 75% for those who entered within one year, and 56% for those who delayed entry. The graduation rates for the fall cohort were 69% for those who did not delay and 50% for those who did; for the spring cohort, the rates dropped to 61% for those who entered within one year and 38% for those who delayed entry.

At institutions with more than 15,000 students, 77% of the AA transfers persisted, 89% attained good standing, and 66% graduated. At institutions with fewer than 15,000 students, 71% persisted, 89% attained good standing, and 57% graduated within the specified time.

Of those students who initially transferred into a State university where the average composite Scholastic Aptitude Test score was above 1025, 79% persisted, 89% attained good standing, and 70% graduated. Of those AA transfers entering a university where the average composite Scholastic Aptitude Test score was below 1000, 70% persisted, 88% attained good standing, and 54% graduated. Of those attending universities where average scores were between 1000 and 1025, 74% persisted, 88% attained good standing, and 62% graduated.

The ratio of male AA transfers to female AA transfers was greatest in the most selective universities (average Scholastic Aptitude Test score above 1025). Likewise, the ratio of younger to older AA transfers was greatest at these universities. The ratio of White to Black AA transfers and the ratio of White to Hispanic AA transfers were lowest at the least selective universities in the System (average score below 1000).

A full-time student in the State University System took 12 or more hours per term.

Of those AA transfers who attended full-time during their first term in a State university, 82% persisted, 90% attained good academic standing, and 75% graduated within the specified time. Among those who enrolled part-time during the first term, 65% persisted, 87% attained good standing, and 45% graduated.

Of the AA transfer students who received some kind of financial aid during the first term at the university, 80% persisted, 91% attained good standing, and 72% graduated. Of those who did not receive aid during the first term, 74% persisted, 88% attained good standing, and 60% graduated within the specified time.

The mean community college grade point average was almost 2.95 (*SD* = 0.49), whereas the mean grade point average for the first term in the State University System was approximately 2.68 (*SD* = 0.91). Thus, the AA transfers experienced an average decline of more than 0.26 in their grade point averages, with approximately 59% of the students experiencing some degree of transfer shock. (Data were unavailable for 6% of the students.) Of these students, 73% persisted, 84% attained good standing, and 61% graduated within the specified time. When I compared these figures with attainment rates for students who did not experience transfer shock, I discovered that 84% of this latter group persisted, 98% attained good standing, and 75% graduated.

Almost 42% of the AA transfers in this study requested a change of major after entry into the State University System. More than 12% requested more than one change. Of the students who persisted, 47% changed majors at least one, whereas 26% of those who did not persist changed majors during their enrollment in the System. Of the students who attained good academic standing, 44% changed majors, but only 28% of those who did not attain good standing changed majors. Finally, of the AA transfers who graduated by June 30, 1995, 45% changed majors, 14% more than once. The rate for those who did not graduate was 35%, with 9% more than once.

Almost 76% of those who did not change institutions during the study persisted, and 66% went on to graduate. On the other hand, of the 565 students who did change institutions, 82% persisted and 48% graduated. Therefore, the rate for remaining enrolled at the end of the study was 25 percentage points higher for those who changed institutions during the investigation than for those who remained at the first university attended.

Logistic Regression Analyses for Intermediate Outcomes

I conducted three sets of logistic regression analyses to examine the unique contributions of the different predictor variables to the probability of AA transfer students' persistence, academic performance, and timely graduation from the State University System. I have provided a more detailed explanation regarding the development of the persistence models so that readers might understand the process by which I obtained the final models. I have provided sufficient data for interested individuals to track my process in a similar manner with the academic standing and graduation models.

For each logistic regression, I conducted case analyses to determine if any observations exerted excessive influence on the estimated parameters of the model. I calculated the odds ratio for each sample eliminating the most extreme cases, based on minimum and maximum delta betas. It did not appear that the deletion of the observations under question would result in any qualitative change in the study conclusions, so I kept all cases for which sufficient data were available.

Persistence Models

First, I conducted a series of logistic regression analyses to examine the unique contribution of the different predictor variables to the probability of AA transfer students' persistence in the State University System. Through these investigations, I attempted to produce a parsimonious model that still explained the data, while ensuring that the models at each stage were consistent with current educational attainment theory.

Full Model for the Calibration Sample. First, I performed a direct logistic regression analysis with AA transfer persistence as outcome. Using the likelihood-ratio test to assess the overall relationship, I tested the calibration model with all sixteen predictors against a constant-only model and found that the predictors, as a set, reliably distinguished between persisters and nonpersisters, with χ^2 (16, n = 6,006) = 1084.25, $p < .001$. Using the Wald statistic with an alpha of .05, I found that the individual estimated effects of birth year, college grade point average, time gap between prior postsecondary and university enrollment, institutional selectivity, cohort group, first-term load, first-term change in grade point average, number of requested degree changes, and institution change were all statistically significant. (Refer to Table 2.) The estimated effects of gender, ethnicity, size of first university attended, first-term financial aid, and additional financial aid were not statistically significant. Using an alpha of .001 because of the large size of the sample, I conducted a Hosmer-Lemeshow test to assess the

TABLE 2.
Logistic Regression Results: Persistence Models

(n = 6,006) (N = 12,069)	Persist vs. Not Full/Calibration		Persist vs. Not Reduced/Calibration		Persist vs. Not Reduced/Entire	
Predictor	*B*	Odds Ratio	*B*	Odds Ratio	*B*	Odds Ratio
Gender (Female-Male)	.090	1.094	--	--	--	--
Ethnicity	--	--	--[a]	--	--[a]	--
(White-"Other")	.116	1.123	.129	1.138	-.038	0.963
(Black-"Other")	.273	1.314	.317	1.373	.213	1.238
(Hispanic-"Other")	.365[a]	1.440	.377[a]	1.458	.101	1.106
(White-Black)	-.157	0.855	-.187	0.829	-.251*	0.778
(White-Hispanic)	-.249*	0.780	-.248*	0.781	-.139[a]	0.871
(Black-Hispanic)	-.092	0.912	-.060	0.941	.112	1.119
Birth Year (5 yrs.)[b]	.033***	1.181[c]	.032***	1.174[c]	.027***	1.145[c]
College GPA (0.25)[b]	.876***	1.245[c]	.892***	1.250[c]	.881***	1.247[c]
Time Gap (12 mo.)[b]	-.009***	0.901	-.009***	0.901	-.006***	0.927
Size (Large - Other)	-.003	0.997	--	--	--	--
Selectivity (50 points)[b]	.005***	1.271[c]	.005***	1.271[c]	.005***	1.259[c]
Cohort (Fall-Spring)	.200**	1.221	.206**	1.229	.103[a]	1.108
1st-Term Load (3 hrs)[b]	.120***	1.434[c]	.122***	1.443[c]	.119***	1.427[c]
1st-Term Aid	< .001	1.003	--	--	--	--
1st-Term Δ GPA (.25)[b]	.871***	1.243[c]	.873***	1.244[c]	.805***	1.223[c]
Degree Changes	.818***	2.266[c]	.818***	2.265[c]	.765***	2.150[c]
Institution Δ (Yes-No)	.679***	1.972[c]	.658***	1.930[c]	.727***	2.068[c]
Additional Aid	<.001	1.041	--	--	--	--
Constant	-73.30***	--	-70.81***	--	-60.65***	--

* $p < .05$ ** $p < .01$ *** $p < .001$

[a] $p < .10$

[b] Odds ratios associated with the identified increase for these variables.

[c] Determined to be of practical importance for the population.

goodness of fit of the model, and it produced a fail-to-reject decision with $\hat{C}(8, n = 6{,}006) = 15.53$, $p = .05$, indicating that the predicted values adequately fit the data.

In this full model for the calibration sample, the estimated odds ratios for birth year, college grade point average, selectivity, first-term load, change in first-term grade point average, degree changes, and institution change all indicated an increased odds of persistence as each of these variables increased, whereas the odds ratio for the time gap between initial university enrollment and prior postsecondary enrollment indicated a decreased odds of persistence as the length of delay increased.

I considered the statistically significant effects of birth year, community college grade point average, selectivity, first-term load, first-term change in grade point average, number of degree changes, and institution change to be of practical importance for the population estimate. On the other hand, I determined that the effect of first-term aid was not only not statistically significant, but that it also had no practical importance. Thus, the effect actually was trivial. Finally, although when an AA transfer entered the State University System (fall or spring) was statistically significant ($p < .01$), and although the effect for the sample was determined to be of practical importance, the assessment of practical importance for the population was inconclusive. All other assessments of practical importance for statistically significant effects in the population were inconclusive. Additional information regarding confidence intervals is included in Table 19 of Appendix B.

When I used the traditional cut score of .50, I was able to accurately predict outcomes for more than 96% of the persisters, but only 27% of the nonpersisters (81%

overall) in the calibration sample, and 96% of the persisters and 26% of the nonpersisters in the cross-validation sample (80% overall). Using a cut score of .75, I was able to accurately predict the outcomes for 64% of the nonpersisters and 78% of the persisters in the calibration sample (with an overall "hit rate" of 75%), and 60% of the nonpersisters and 76% of the persisters (72% overall) in the cross-validation sample. As discussed previously, the choice of a decision rule for prediction should depend on the costs of misclassification versus the benefits of accurate classification associated with one's particular reason for using the model.

Reduced Model for the Calibration Sample. I conducted a follow-up backwards stepwise regression analysis using the likelihood-ratio procedure to determine if I could identify a more parsimonious persistence model. I had the statistical program remove one predictor from the full model at a time. It compared log-likelihood ratios after each step to determine if goodness of fit was maintained with the elimination of a given predictor. I decided to remove a predictor if p exceeded .10. Although Hosmer and Lemeshow (1989, p. 108) recommended an even larger alpha, I chose the SPSS default of .10 because of the large sample sizes. I repeated this process until there was a significant change in the goodness of fit. The reduced model eliminated gender, institutional size, first-term financial aid, and additional financial aid. Its model chi-square was $\chi^2(12, n = 6{,}006) = 1081.66, p < .001$, indicating that the reduced set of predictors still reliably distinguished between persisters and nonpersisters. The Hosmer-Lemeshow goodness-of-fit statistic led to the decision that the specified logistic model was correct with $\hat{C}(8, n = 6{,}006) = 12.38, p = .135$.

After assessing the fit of the multivariate model, I verified the importance of each variable included in the model. Again, this involved an examination of the Wald statistic for each. I found the influence of age, community college grade point average, the selectivity of the institution, the student's first-term course load, the change in grade point average during the first term, the number of degree changes, institution change, the time gap between university enrollment and prior postsecondary enrollment, and cohort to be statistically significant ($p < .05$), controlling for the other variables in the model. However, I found the practical importance of the latter two to be inconclusive for the population. The estimated logistic regression model coefficients, standard errors, point estimates of the odds ratios, and 95% confidence intervals have been presented in Table 20 in Appendix B.

Ethnicity was left in the model because the overall effect for ethnicity was statistically significant at the .10 level. Upon completing a follow-up analysis of contrasts between ethnic groups, I found the contrast between White AA transfers and Hispanic AA transfers to be statistically significant ($p < .05$) and of practical importance in the sample, but inconclusive for the population.

When I used the traditional cut score of .50, I was able to accurately predict outcomes for 96% of the persisters, but only 27% of the nonpersisters in the calibration sample (an overall hit rate of 81%). When I applied the model to the cross validation sample, my ability to correctly classify the students dropped by only 1%. However, when I used a cut score of .75 for this reduced model, I was able to accurately predict outcomes for 64% of the nonpersisters and 78% of the persisters (75% overall). When I applied the model to the cross-validation sample, I was able to correctly classify 60% of the nonpersisters and 76% of the persisters (72% overall).

Reduced Model for the Entire Sample. Because I judged the decision rule to be acceptable based on the cross-validation hit rates, I recombined the calibration and cross-validation samples and performed a direct logistic regression on persistence for the entire group, using the reduced set of variables identified in the previous model. This process provided me with a final model with more precise coefficients and gave me the opportunity to delineate more clearly those significant effects of practical importance.

In the final model, the estimated effects for birth year, college grade point average, selectivity, first-term course load, first-term change in grade point average, number of requested degree changes, and institution change were all statistically significant ($p < .05$), of practical importance, and indicated an increased odds of persistence as each of these variables increased. The estimated effect for the time gap between initial university enrollment and prior postsecondary enrollment, although statistically significant, indicated a decreased odds of persistence as the length of delay increased, and the determination of practical importance was inconclusive. Although ethnicity overall was statistically significant only at the .10 level, the contrast between White and Black AA transfers was statistically significant at the .05 level. Once again, however, the determination of practical importance was inconclusive. The estimated logistic regression model coefficients, standard errors, point estimates of the odds ratios, and 95% confidence intervals have been presented in Table 21 of Appendix B.

I have provided the deciles of risk for the Hosmer-Lemeshow test of the final persistence model in Table 3. One will quickly note that the group for whom the accuracy of prediction was worst included the nonpersisters in the highest decile of risk, for whom only 62% of the observed outcomes were predicted. Nonpersisters were noticeably overpredicted in the 4th and 6th deciles. Overall, the Hosmer-Lemeshow test reinforced the finding that the model did a better job of predicting persistence than nonpersistence.

TABLE 3.
Hosmer-Lemeshow Goodness of Fit: Final Persistence Model

	Not Persist			Persist		
Group	Observed	Expected	Expected/ Observed	Observed	Expected	Expected/ Observed
1	784	757.47	0.97	423	449.53	1.06
2	513	475.33	0.93	694	731.67	1.05
3	340	357.36	1.05	867	849.64	0.98
4	242	286.67	1.18	965	920.33	0.95
5	223	233.19	1.05	984	973.81	0.99
6	166	189.88	1.14	1041	1017.12	0.98
7	149	154.63	1.04	1058	1052.37	0.99
8	124	122.03	0.98	1083	1084.97	1.00
9	94	90.73	0.97	1113	1116.27	1.00
10	84	51.73	0.62	1122	1154.27	1.03

As a diagnostic tool, it was helpful to examine the characteristics of those students for whom the final model did not accurately predict persistence outcomes. I ran descriptive statistics for the AA transfers with the largest discrepancies in fit, based upon those cases with a studentized residual less than -2.5 or greater than 2.5. For this analysis, I kept the cut value at .75. Descriptive statistics for those AA transfers whose cases were not fit well by the final persistence model are included in Table 22 of Appendix B. Of the 34 students who had the greatest residuals, all were nonpersisters–82% of whom left in good academic standing. I found statistically significant differences in the means ($p < .05$) for cases with these large discrepancies in fit and the rest of the sample for community college grade point average, first-term course load, first-term change in grade point average, number of requested degree changes, and institutional change. Of those students whose persistence outcome was not fit well by the model, 65% had community college grade point averages of a 3.0 or above. Almost all (94%) attended large institutions on a full-time basis during the first term. Only 35% experienced transfer shock. Approximately 65% changed majors more than once. Finally, almost 15% of these students had changed institutions, as compared with 4% of the rest of the students.

Academic Standing Models

I followed similar procedures to develop three models for the outcome variable of academic standing. First, I performed a direct logistic regression analysis for the full calibration model against a constant-only model. Then, I utilized the stepwise procedure that included backward elimination based on likelihood-ratio procedures, followed by a test for forward selection, to come up with a more parsimonious model. Finally, I recombined the calibration and cross-validation samples and performed a direct logistic regression on AA transfer academic standing for the entire group, using the reduced set of variables identified in the previous model. (See Table 4.)

Full Model for the Calibration Sample. Using all sixteen predictor variables, I found that the full model had a statistically significant overall effect and that the predicted values adequately fit the data. The estimated effects of gender, community college grade point average, university selectivity, cohort, the change in grade point average during the first term, the number of degree changes requested, institution change, and the contrast between Hispanic and "Other" AA transfers were statistically significant ($p < .05$). I concluded that these effects all were of practical importance except for the effect of university selectivity; this assessment was inconclusive. As with the initial persistence model, I determined that the estimated population effect of first-term financial aid was trivial, controlling for the other variables in the model.

I noted an increase in the odds ratio for each of the significant variables when the value increased and I controlled for the effects of other variables in the model. The estimated logistic regression model coefficients, standard errors, point estimates of odds ratios, and 95% confidence intervals have been presented in Table 19 of Appendix B.

Classification results associated with a .50 decision rule cut point indicated that only 37% of students in the calibration sample who achieved a cumulative university grade point average less than 2.0 were correctly identified by the decision rule, whereas 98% of the AA transfers who attained good academic standing with a grade point average greater than or equal to 2.0 were correctly identified by the decision rule (overall rate of 91%).

TABLE 4.
Logistic Regression Results: Academic Standing Models

(*n* = 6,004) (*N* = 12,069)	Good vs. Not Good Full/Calibration		Good vs. Not Good Reduced/Calibration		Good vs. Not Good Reduced/Entire	
Predictor	*B*	Odds Ratio	*B*	Odds Ratio	*B*	Odds Ratio
Gender (Female-Male)	.423***	1.526[c]	.430***	1.537[c]	.386***	1.471[c]
Ethnicity	–[a]	--	–[a]	--	–[a]	--
(White-"Other")	.441[a]	1.555	.443*	1.557	.259	1.296
(Black-"Other")	.400	1.492	.396	1.486	.128	1.136
(Hispanic-"Other")	.758**	2.135[c]	.754**	2.126[c]	.453*	1.572
(White-Black)	.041	1.042	.047	1.048	.132	1.141
(White-Hispanic)	-.317[a]	0.728	-.312[a]	0.732	-.193	0.824
(Black-Hispanic)	-.358	0.699	-.358	0.699	-.325[a]	0.723
Birth Year (5 yrs.)[b]	.011	1.055	--	--	--	--
College GPA (0.25)[b]	2.303***	1.778[c]	2.279***	1.768[c]	2.430***	1.836[c]
Time Gap (12 mo.)[b]	.003	1.034	--	--	--	--
Size (Large - Other)	-.065	0.937	--	--	--	--
Selectivity (50 points)[b]	.004*	1.197	.003*	1.040	.004***	1.209[c]
Cohort (Fall-Spring)	.322**	1.379[c]	.312**	1.366[c]	.198*	1.219
1st-Term Load (3 hrs)[b]	-.007	0.980	--	--	--	--
1st-Term Aid	<.001	1.001	--	--	--	--
1st-Term Δ GPA (0.25)[b]	1.710***	1.534[c]	1.704***	1.531[c]	1.636***	1.505[c]
Degree Changes	.708***	2.030[c]	.706***	2.025[c]	.613***	1.846[c]
Institution Δ (Yes-No)	.592*	1.807[c]	.597*	1.817[c]	.550***	1.733[c]
Additional Aid	-<.001	0.992	--	--	--	--
Constant	-29.10	--	-7.82***	--	-8.47***	--
* $p < .05$ ** $p < .01$ *** $p < .001$	Model $\chi^2 = 1450.318$ $df = 16, p < .001$ H-L Goodness of Fit: $\chi^2 = 5.6104$ $df = 8, p = .6908$		Model $\chi^2 = 1448.961$ $df = 10, p < .001$ H-L Goodness of Fit: $\chi^2 = 4.4013$ $df = 8, p = .8192$		Model $\chi^2 = 2815.633$ $df = 10, p < .001$ H-L Goodness of Fit: $\chi^2 = 3.4913$ $df = 8, p = .8999$	

[a] $p < .10$

[b] Odds ratios associated with the identified increase for these variables.

[c] Determined to be of practical importance for the population.

Classification results for the cross-validation sample were similar. When I used a cut point of .85 for the calibration sample, I was able to correctly predict outcomes for 73% of the students who did not achieve good academic standing, and 87% of the transfers who did (overall rate of 85%). Again, results were similar for the cross-validation sample.

Reduced Model for the Calibration Sample. Continuing with the model refinement process, I conducted a backwards stepwise analysis. The resulting estimated logistic regression model coefficients are shown in Table 20 of Appendix B. The strength of the overall relationship was statistically significant, and a test of the Hosmer-Lemeshow chi-square statistic for the model fit produced a fail-to-reject decision, indicating that the predicted values adequately fit the data. I concluded that the statistically significant effects ($p < .05$) of gender, community college grade point average, cohort, first-term change in grade point average, number of degree changes, institutional change, the contrast between White students and "Other" students, and the contrast between Hispanic students and "Other" students were of practical importance; institutional selectivity, although statistically significant, was not of practical importance. Controlling for the other variables in the model, all of these variables were associated with an increase in the odds of an AA transfer attaining good academic standing as the value for each variable increased.

I obtained correct classification rates for the calibration sample of 36% for students not in good standing and 98% for students in good standing (91% overall) when I used the .50 cut score, with similar rates for the cross-validation sample. However, when I used the .85 cut score, I correctly identified 73% of the students who did not obtain at least a 2.0 and 87% (overall rate of 85-86%) of those transfers who did in both samples.

Reduced Model for the Entire Sample. For the final academic standing model involving the entire sample, the odds ratios for gender, community college grade point average, institutional selectivity, cohort group, first-term change in grade point average, number of degree changes, and institution change all indicated an increased odds of a student attaining a cumulative grade point average greater than or equal to 2.0 as each of these variables increased. However, the results from the analysis for practical importance of the cohort effect were inconclusive. The odds of Hispanic AA transfers attaining a cumulative grade point average greater than or equal to 2.0 was 57% greater than the odds of "Other" AA transfers doing so, controlling for the other independent variables, but the analysis for the practical importance of this finding also was inconclusive. (See Table 21 of Appendix B.)

I have provided the deciles of risk for the Hosmer-Lemeshow test of the final academic standing model in Table 5. This model was least effective in predicting the actual outcome for students who did not attain good academic standing and who were in the two highest deciles of risk. The model did an excellent job of predicting those who did attain a cumulative grade point average of 2.0 or better.

To assess the characteristics of those students for whom the final model did not accurately predict academic standing, I ran descriptive statistics for the AA transfers with the largest discrepancies in fit–that is, a studentized residual less than -2.5 or greater than

TABLE 5.
Hosmer-Lemeshow Goodness of Fit: Final Academic Standing Model

	Cumulative GPA < 2.0			Cumulative GPA ≥ 2.0		
Group	Observed	Expected	Expected/ Observed	Observed	Expected	Expected/ Observed
1	692	687.78	0.99	515	519.22	1.01
2	262	251.17	0.96	945	955.83	1.01
3	135	136.84	1.01	1072	1070.16	1.00
4	78	83.13	1.07	1129	1123.87	1.00
5	51	52.79	1.04	1156	1154.21	1.00
6	30	35.51	1.18	1176	1170.49	1.00
7	25	23.59	0.94	1182	1183.41	1.00
8	16	14.68	0.92	1191	1192.32	1.00
9	7	8.71	1.24	1200	1198.29	1.00
10	2	3.98	1.99	1205	1203.02	1.00

2.5. (See Table 22 in Appendix B.) For this analysis, I kept the cut value at .85. Of the 110 students who had the greatest residuals, 72% were nonpersisters, none graduated, and none achieved good academic standing. I found statistically significant differences in the means ($p < .05$) between the two groups for White students, Hispanic students, first-term load, first-term change in grade point average, number of requested degree changes, and institutional change. Only 71% of the students whose academic standing outcome was not fit well by the model were White, 59% attended on a full-time basis during the first term, 55% experienced transfer shock, and 9% changed institutions. These percentages were lower than those for the rest of the students in the study. However, a greater percentage of the students not fit well by the model were Hispanic (18%) and changed majors more than once (29%).

Graduation Models

Finally, I applied the three-step process to the graduation outcome variable. All three models were statistically reliable and had adequate correct classification rates. Model coefficients and odds ratios are presented in Table 6.

Full Model for the Calibration Sample. When I tested the full graduation model for the calibration sample against a constant-only model, I discovered that the overall effect was statistically significant. The individual estimated effects for age, community college grade point average, university selectivity, first-term course load, the change in grade point average during the first term at the university, number of degree changes, and institutional change were all statistically significant ($p < .05$) and determined to be of practical importance. Additionally, the estimated effects of gender, time gap between university enrollment and prior postsecondary enrollment, and cohort were statistically significant, but the assessments of practical importance were inconclusive. I determined that the estimated effects for both first-term and additional financial aid were trivial. (See Table 19 in Appendix B).

The model indicated that AA transfers who changed institutions within the State University System were 87% as likely to graduate by June 30, 1995, as the students who remained at the same university. (Again, this result should be interpreted with caution because of the large ratio between students staying at the same university and those who

TABLE 6.
Logistic Regression Results: Graduation Models

(N = 12,069) (n = 6,006)	Graduate vs. Not Full/Calibration		Graduate vs. Not Reduced/Calibration		Graduate vs. Not Reduced/Entire	
Predictor	B	Odds Ratio	B	Odds Ratio	B	Odds Ratio
Gender (Female-Male)	.159*	1.173	.155*	1.167	.145**	1.157
Ethnicity	--	--	--	--	--	--
(White-"Other")	.195	1.215	--	--	--	--
(Black-"Other")	-.017	0.983	--	--	--	--
(Hispanic-"Other")	.285	1.330	--	--	--	--
(White-Black)	.212	1.236	--	--	--	--
(White-Hispanic)	-.090	0.914	--	--	--	--
(Black-Hispanic)	$-.302^a$	0.740	--	--	--	--
Birth Year (5 yrs.)^b	.036***	1.197^c	.035***	1.193^c	.030***	1.163^c
College GPA (0.25)^b	.834***	1.232^c	.842***	1.234^c	.867***	1.242^c
Time Gap (12 mo.)^b	-.008***	0.914	-.008***	0.913	-.007***	0.925
Size (Large - Other)	-.019	0.982	--	--	--	--
Selectivity (50 points)^b	.007***	1.391^c	.007***	1.391^c	.006***	1.343^c
Cohort (Fall-Spring)	.190**	1.209	.197**	1.218	.181***	1.198
1st-Term Load (3 hrs)^b	.205***	1.847^c	.206***	1.853^c	.195***	1.797^c
1st-Term Aid	< .001	1.023	--	--	--	--
1st-Term Δ GPA (0.25)^b	.929***	1.262^c	.932***	1.262^c	.876***	1.245^c
Degree Changes	.393***	1.481^c	.392***	1.480^c	.375***	1.454^c
Institution Δ (Yes-No)	-.872***	0.418^c	-.888***	0.412^c	-.775***	0.461^c
Additional Aid	< .001	1.016	--	--	--	--
Constant	-81.83***	--	-80.26***	--	-69.6***	--
* $p < .05$ ** $p < .01$ *** $p < .001$	Model χ^2 = 1511.988 df = 16, $p < .001$ Goodness of Fit χ^2 = 8.0536 df = 8, p = .4282		Model χ^2 = 1506.334 df = 10, $p < .001$ Goodness of Fit χ^2 = 11.8119 df = 8, p = .1598		Model χ^2 = 2808.355 df = 10, $p < .001$ Goodness of Fit χ^2 = 21.5279 df = 8, p = .0059	

[a] $p < .10$
[b] Odds ratios calculated for the identified increase for these variables.
[c] Determined to be of practical importance for the population.

changed institutions.) Other significant effects were associated with an increased odds of graduation within the specified time when the value of any of these variables increased, controlling for the effects of the other variables in the model. I have included additional information regarding confidence intervals in Table 19 in Appendix B.

I was able to correctly classify 76% of the students in the calibration sample (47% of the nongraduates and 90% of the graduates) and 74% in the cross-validation sample (46% of the nongraduates and 88% of the graduates) when I used a cut score of .50. When I changed the cut score to .65, to match the expected percentage of graduates based on data from earlier years, I was able to correctly identify 67% of the nongraduates and 77% of the graduates in the calibration sample (74% overall) and 65% of the nongraduates and 76% of the graduates in the cross-validation sample (72% overall).

Reduced Model for the Calibration Sample. Using the backwards stepwise regression analysis with the likelihood-ratio procedure, I found that the new model eliminated ethnicity, institutional size, first-term financial aid, and additional financial aid. I determined that the statistically significant estimated effects of age, community college grade point average, institutional selectivity, first-term course load, first-term change in grade point average, the number of degree changes, and institution change also were of practical importance, whereas my assessments of the practical importance of the other effects were inconclusive. The estimated model coefficients and related odds ratios have been presented in Table 6. Information regarding confidence intervals is in Table

20 in Appendix B.

Using a decision rule cut point of .50, I was able to correctly classify 47% of the nongraduates and 90% of the graduates (overall hit rate of 76%) for the calibration sample and 46% of the nongraduates and 88% of the graduates in the cross-validation sample (74% overall). When I changed the decision cut score to .65 for the calibration sample, I was able to improve the level of correct classification for the nongraduates to 67%, whereas the correct identification of the graduates dropped to 77% (overall hit rate of 73%). When I applied the model to the cross-validation sample, rates dropped slightly to 65% and 76% respectively, with 72% correctly classified overall.

Reduced Model for the Entire Sample. In the reduced model for the entire sample, I found gender, birth year, college grade point average, time gap between other postsecondary and university enrollment, university selectivity, cohort group, first-term load, first-term change in grade point average, degree changes, and institution change to be statistically significant at the .05 level. However, the determination of practical importance in the population was inconclusive for gender, time gap, and cohort group. (See Table 21 in Appendix B.) Each of the statistically significant and practically important odds ratios, except for institution change, indicated an increased odds of a student graduating within the specified time as each of these variables increased. The odds of a student who transferred between universities graduating were 54% less than for those who remained at the same university, controlling for the other variables.

According to the Hosmer-Lemeshow deciles of risk (Table 7), the final graduation model was least effective in predicting the actual outcome for students who did not graduate and who were in the highest decile of risk. When I assessed the characteristics of those students for whom the final model did not accurately predict graduation within the specified time, I determined that only thirteen students had exceptionally large discrepancies in fit–that is, a studentized residual less than -2.5 or greater than 2.5. (See Table 22 in Appendix B.) For this analysis, I kept the cut value at .65. All 13 students achieved good academic standing, but only 5 persisted, and 4 graduated. I found statistically significant differences in the means ($p < .05$) between the two groups for Hispanic students and community college grade point average. Five of the 13 students not fit well by the model were Hispanic, and 9 of the 13 had community college grade point averages of 3.0 or above.

TABLE 7.
Hosmer-Lemeshow Goodness of Fit: Final Graduation Model

	Not Graduate			Graduate		
Group	Observed	Expected	Expected/ Observed	Observed	Expected	Expected/ Observed
1	972	972.65	1.00	236	235.35	1.00
2	744	715.66	0.96	464	492.34	1.06
3	576	563.24	0.98	632	644.76	1.02
4	456	447.62	0.98	752	760.38	1.01
5	339	361.94	1.07	869	846.06	0.97
6	266	295.60	1.11	942	912.40	0.97
7	230	239.44	1.04	978	968.56	0.99
8	176	187.93	1.07	1032	1020.07	0.99

9	136	139.89	1.03	1072	1068.11	1.00
10	115	86.04	0.75	1091	1119.96	1.03

Summary of Logistic Regression Analyses

Selected variables found to have a significant effect ($p < .05$) on at least one of the three outcomes included gender, age, community college grade point average, time gap between community college and university enrollment, average university Scholastic Aptitude Test score, term of entry, first-term course load, first-term change in grade point average, number of degree changes, and change of institution within the System. However, the determination of practical importance in the population was inconclusive for any statistically significant effects for time gap and cohort group.

The odds of Y = 1 (i.e., persistence, academic good standing, or graduation) for a given AA transfer can be determined by exponentiating the associated logit–that is, *odds* $(X_i) = e^g$ where $g_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots + \beta_k X_{ki}$ (Tate, 1995). The final three models for persistence, good academic standing, and timely graduation were as follows:

The *odds* (persistence = 1) = e^g, where g = (-60.65) -.038 (White) + .213 (Black) + .101 (Hispanic) + .027 (birth year) + .881 (community college grade point average) - .006 (time gap between prior postsecondary enrollment and university enrollment) + .005 (university selectivity) + .103 (cohort) + .119 (first-term course load) + .805 (first-term change in grade point average) + .765 (number of degree changes) + .727 (institution change). Therefore, for a typical student (using the median or mode for dichotomous variables and the mean for continuous variables), the odds of persistence were e^g, where g

= (-60.65) -(.038) (1) + (.213) (0) + (.101) (0) + (.027) (1966.74) + (.881) (2.95) - (.006) (5.77) + (.005) (1030.16) + (.103) (1) + (.119) (11.01) + (.805) (-.26) + (.765) (.56) + (.727) (0) = 1.54. Thus, the odds of persistence for an AA transfer with these characteristics were 4.66. The average probability (Tate, 1995) of a student with these characteristics persisting was equal to $e^g/(1+ e^g) = .82$.

The *odds* (good standing = 1) = e^g, where g = (-8.47) + .386 (gender) +.259 (White) + .128 (Black) + .453 (Hispanic) + 2.430 (community college grade point average) + .004 (university selectivity) + .198 (cohort) + 1.636 (first-term change in grade point average) + .613 (number of degree changes) + .550 (institution change). Therefore, for a typical student (using the median or mode for dichotomous variables and the mean for continuous variables), the odds of attaining good academic standing were e^g, where g = 3.38. Thus, the odds of an AA transfer with these characteristics attaining good academic standing were 29.34. The average probability of a student with these characteristics attaining good academic standing was equal to $e^g/(1+ e^g) = .97$.

Finally, the *odds* (graduation = 1) = e^g, where g = (-69.6) + .145 (gender) + .030 (birth year) + .867 (community college grade point average) - .007 (time gap between prior postsecondary enrollment and university enrollment) + .006 (university selectivity) + .181 (cohort) + .195 (first-term course load) + .876 (first-term change in grade point average) + .375 (number of degree changes) - .775 (institution change). Therefore, for a typical student (using the median or mode for dichotomous variables and the mean for continuous variables), the odds of persistence were e^g, where g = 0.82. Thus, the odds of graduation for an AA transfer with these characteristics were 2.28. The average

BEST COPY AVAILABLE

probability of a student with these characteristics graduating within the specified time was equal to $e^g/(1+e^g) = .69$.

Descriptive Statistics for Final Outcome Groups

For the discriminant analyses, I chose most of the predictor variables from the array assessed in the logistic regression analyses. I included those variables found to be significant predictors of the probability of the intermediate outcomes of persistence, good standing, and timely progression to graduation. Therefore, I included gender, birth year, community college grade point average, time gap between prior postsecondary enrollment and initial entry into the State University System, institutional selectivity, term of entry into the System, first-term course load, first-term change in grade point average, number of degree changes, and change of institution within the System.

Although ethnicity was not determined to have a global significance at the .05 level for the logistic regression models, I chose to keep this variable in the discriminant analysis models, just as I had in the intermediate models. Then, because I was interested in taking these analyses of undergraduate attainment outcomes one step further, I also included the total number of terms (TOTTERM) an AA transfer attended a State university during the time of this study. I chose not to include a student's cumulative grade point average, because I became concerned that, although the combination of these two variables might account for much of the final grouping of students, models including both might lose much of their effectiveness as intervention models.

The grouping variable for the discriminant analyses was based on student outcome groups as of June 30, 1995: graduates, students still enrolled in a baccalaureate program in the State University System, nonpersisters who withdrew with a cumulative grade point average greater than or equal to 2.0, and nonpersisters who withdrew with a cumulative grade point average less than a 2.0. Descriptive statistics for cases included in the discriminant analyses, broken out by the comparison groups, appear in Table 8. (Descriptive statistics for the calibration sample are included in Table 23 in Appendix B.)

When I examined the basic descriptive statistics for AA transfers in each of the final outcome groups, I discovered that, whereas 57% of the students in the sample under consideration were female, 58% of the graduates were female and 52% of those still enrolled were females, 63% of those who left in good standing were female, and only 45% of those who left not in good standing were female. I decided to break these student groups down further, and look at outcome groups based on students' gender, ethnicity, and age. (See Table 9.) As in the earlier analyses, I discovered that "Other" older females and younger White females graduated at the highest rates; older Hispanic and Black males graduated at the lowest rates. A higher proportion of Hispanic and Black students were still enrolled at the end of the investigation period. A higher proportion of older students left the State University System in good academic standing. Whereas younger Black males left the System not in good academic standing at the highest rates, "Other" older students and older White females had the lowest rates of leaving the System not in good standing.

The average community college grade point average was just as high for those students who left the System in good academic standing as for those who graduated by

June 30, 1995. More than half of the students who left in good standing had transferred into the System with grade point averages of 3.0 or above. More than 80% of the

TABLE 8.
Summary of Variable Characteristics for Entire Sample Used for Discriminant Analysis

Predictor Variables	Graduates Mean (*SD*)	Persisters Still Enrolled Mean (*SD*)	Nonpersisters GPA>2.0 Mean (*SD*)	Nonpersisters GPA<2.0 Mean (*SD*)	Total Mean (*SD*)
Gender (Female = 1)	.58	.51	.64	.45	.57
	(.49)	(.50)	(.48)	(.50)	(.50)
Ethnicity					
(White = 1)	.82	.73	.79	.76	.80
	(.39)	(.44)	(.41)	(.42)	(.40)
(Black = 1)	.05	.08	.05	.08	.05
	(.21)	(.28)	(.21)	(.27)	(.22)
(Hispanic = 1)	.09	.15	.13	.11	.11
	(.29)	(.36)	(.34)	(.31)	(.31)
Birth Year	1967.24	1965.93	1964.78	1967.66	1966.81
	(5.91)	(6.59)	(7.31)	(4.65)	(6.15)
Community College GPA	2.99	2.90	2.99	2.63	2.95
	(.48)	(.47)	(.49)	(.41)	(.49)
Enrollment Time Gap	4.49	7.08	10.06	5.38	5.59
	(13.36)	(17.28)	(24.27)	(14.43)	(15.88)
Institutional Selectivity	1034.28	1020.40	1020.69	1029.83	1030.58
	(40.10)	(38.48)	(39.17)	(38.44)	(40.07)
Cohort Group (Fall = 1)	.73	.61	.67	.67	.70
	(.44)	(.49)	(.47)	(.47)	(.46)
First-Term Load	11.96	8.93	9.33	10.49	11.15
	(3.00)	(3.96)	(4.19)	(3.55)	(3.55)
First-Term GPA Change	-.12	-.43	-.16	-1.24	-.26
	(.71)	(.94)	(.76)	(.93)	(.83)
Degree Changes	.61	.80	.37	.28	.57
	(.79)	(.86)	(.63)	(.56)	(.77)
Institution Change (Yes = 1)	.03	.13	.03	.03	.04
	(.17)	(.34)	(.16)	(.18)	(.20)
Total Number of Terms	6.42	8.24	3.69	3.09	5.95
	(1.69)	(2.33)	(2.24)	(1.94)	(2.37)
Valid *N* (Listwise)	8061	1289	1604	1110	12064

TABLE 9.
Final Outcome Rates[a] By Race, Gender, and Age

	Graduate	Still Enrolled	Nonpersister in Good Standing	Nonpersister Not in Good Standing
Younger[b] White Males	68%	10%	9%	13%
Younger White Females	72%	8%	12%	8%
Younger Black Males	54%	19%	6%	22%
Younger Black Females	62%	16%	11%	12%
Younger Hispanic Males	56%	20%	13%	12%
Younger Hispanic Females	64%	12%	15%	9%
Younger Other Males	69%	11%	8%	12%
Younger Other Females	68%	7%	13%	12%
Older[c] White Males	56%	15%	20%	9%
Older White Females	60%	13%	23%	4%
Older Black Males	48%	21%	15%	16%
Older Black Females	50%	19%	16%	15%
Older Hispanic Males	43%	16%	23%	17%
Older Hispanic Females	49%	18%	27%	7%
Older Other Males	64%	14%	19%	3%
Older Other Females	77%	11%	9%	3%

[a] Total rates greater than 100% due to rounding error.
[b] Younger students were born after 1965.
[c] Older students were born in or before 1965.

students who left the System not in good academic standing transferred in with a community college grade point average below a 3.0. Rates of departure not in good standing also were higher for students who experienced transfer shock than for those who did not.

For those students who went ahead and enrolled in the State University System within one year of completing earlier postsecondary studies, 67% graduated as compared with 47% of those who delayed. On the other hand, of those who waited longer than one year, 27% left the System in good academic standing as compared to 12% of those who did not delay. Students who initially attended on a part-time basis also left the System in good academic standing at a higher rate (22%) than full-time students (9%).

Of those students who initially transferred into a State university where students had an average composite Scholastic Aptitude Test score above 1025, 11% left the System in good academic standing, as compared with 15% of those attending institutions with an average composite Scholastic Aptitude Test score between 1000 and 1025, and 19% of those attending institutions with an average composite Scholastic Aptitude Test score below 1000. Students in the most selective institutions graduated at the highest rates, whereas the percentages of students who were still enrolled at the end of the study were highest at the least selective of the institutions under study (composite Scholastic Aptitude Test scores below 1000). Between 9% and 10% of the students from institutions with various levels of selectivity left with grade point averages less than 2.0.

More than 39% of the students who remained enrolled at the end of the study entered the State university System with the spring cohort, whereas fewer than 27% of the graduates entered in the spring. Almost 15 % of the spring cohort left the System in good standing, and another 11% left not in good academic standing, at rates somewhat higher than the fall cohort.

Fewer than 47% of the students who entered on a part-time basis graduated by June 30, 1995, but more than 75% of the students who entered on a full-time basis graduated. On the other hand, almost 20% of the part-time students were still enrolled, as compared to 7% of the full-time students. Almost 22% of the part-time students left the System in good academic standing, as compared to only 9% of the full-time students. Almost 12% of the part-time students and 9% of the full-time students left not in good academic standing.

Students in all four outcome groups tended to experience some degree of transfer shock during the first term in the university. More than 54% of the graduates experienced transfer shock, whereas almost 66% of those still enrolled experienced a decrease. Of the nonpersisters, almost 58% of those who left in good standing and 92% of those who left not in good standing experienced transfer shock.

Whereas almost 45% of the graduates requested one or more degree changes while in the System, 57% of the still enrolled transfers requested at least one change. Of the AA transfers who left the State University System prior to graduation, almost 30% of those in good standing and 23% of those not in good standing requested one or more degree changes. Almost 14% of the students who remained enrolled at the end of the study had changed institutions within the System. However, only 3% to 4% of the transfers in the other outcome groups had changed institutions.

The mean cumulative grade point average for AA transfers who graduated by June 30, 1995, was 3.09 (*SD* = 0.48), whereas the mean for those who left the System not in good academic standing was 1.20 (*SD* = 0.61). Students who remained enrolled at the end of the investigation had a mean of 2.65 (*SD* = 0.66), and students who left the System in good academic standing had a mean of 2.85 (*SD* = 0.59). Although some of the nonpersisters attended as many as ten terms during this investigation, 40% of those who left in good standing did so in the first or second term, and almost 50% of those who left not in good standing did so in the first or second term. By the end of the fourth term, 64% of all of the students who left in good standing and 77% of the students who left not in good standing had withdrawn.

Female graduates moved through the System more quickly than males, attending an average of 6.33 terms as compared with 6.57 terms for males. Of the AA transfers who graduated during the investigation, 59% of the White students, 47% of the Black students, 41% of the Hispanic students, and 50% of the "Other" students did so in six or fewer terms. Older graduates took, on average, longer to finish than younger graduates.

Although I decided not to include cumulative grade point average in the discriminant analysis models, I did look at some descriptive statistics for this variable. The mean cumulative grade point average for female AA transfers was 2.94, whereas the mean for males was 2.67. The mean was 2.86 for White transfers, 2.53 for Black transfers, 2.74 for Hispanic transfers, and 2.72 for "Other" transfers. Students born in or before 1965 attained a mean cumulative grade point average of 3.07, whereas younger students attained a mean of 2.75.

Predictive Discriminant Analysis Models for Final Outcomes

Calibration Model

As with the logistic regression analyses, I split the entire sample into the calibration sample consisting of 6,004 students and a cross-validation sample consisting of 6,057 students. Among the predictor variables, only two correlations exceeded .25 in absolute value. As one might expect, Black was negatively correlated with White ($r = -.47$), and Hispanic was negatively correlated with White ($r = -.69$). The modest correlations indicated that multicollinearity did not exist among other predictor variables.

After my initial assessment of the data set and the identification and proper coding of missing and miscoded data, I still discovered outliers as I was preparing to conduct the first predictive discriminant analysis. I had no indication that these outliers were due to a recording error, an entry error, or a processing error, but that the students truly were members of the AA transfer population. Therefore, I decided not to remove these outliers from the analysis. (A follow-up study in which I removed identified outliers did not substantially change the basic structure of the model. Considered individually, the apparent outliers did not appear to have an impact on the group centroids, probably due to the large sample sizes. When considered simultaneously, the model coefficients changed some, although the relative size and sign of these beta weights did not change. As one might expect, the rate of correct classifications improved by a couple of percentage points when outliers were not included in the study.)

SPSS for Windows 7.5/8.0, the statistical package used for these analyses, did not contain a test for checking directly for violations of the assumption of multivariate normality. Therefore, I checked univariate normality in an effort to detect possible violations of joint normality. Based on a visual inspection of histograms and bivariate scatterplots, I saw evidence of potential skewness and multimodal distributions on several variables. However, Stevens (1992) reported that MANOVA had been shown to be robust to deviations from mutivariate normality (p. 247). The large sample size helped reduce the possibility of a problem. Klecka (1980), citing Lachenbruch, also reported that discriminant analysis is robust enough to tolerate some deviation from the normality assumption (p. 61).

In order to assess whether there were any violations of the homogeneity of variance/covariance matrices assumption, I conducted a Box's M multivariate test for homogeneity of dispersion matrices (Norušis, 1994b, p. 37). The test indicated that I should reject the null hypothesis that the covariance matrices were equal with F (315; 11,819,847) = 13.93, $p < .001$. Unfortunately, the Box's M test is sensitive to non-normality, which can lead to the erroneous conclusion that population variances are different when in fact the test is influenced by non-normality in the underlying population (Stevens, 1992, p. 260). Therefore, I followed up with univariate homogeneity of variance tests. For each variable, the Levene statistic (SPSS, Inc., 1996, p. 30) was significant ($p < .001$), leading to a rejection of the null hypothesis that the error variance for each variable was equal across groups (3;6000 degrees of freedom). A closer inspection of the sample statistics for each discriminating variable across each group (Table 8) indicated that there were differences in the standard deviations on a number of variables. For some variables, the smallest variance was associated with the largest group (graduates), which could result in the overall MANOVA test being liberal–that is, that the actual alpha could be larger than the nominal alpha–and could lead to rejecting hypotheses falsely (Stevens, 1992, p. 257). To help address this issue, I established a more stringent alpha (.001) for the overall MANOVA test and subsequent follow-up comparisons, with the recognition that the actual alpha could be higher than .001.

Klecka (1980) contended that "discriminant analysis can be performed when the assumptions of multivariate normal distributions and equal group covariance matrices are not satisfied. The problem comes with using the results" (p. 62). Therefore, I decided to proceed cautiously with this discriminant analysis. The large size of the sample reduced some of the concerns, and throughout the analysis, I tried to refer to assessments that did not depend on these assumptions, when possible. However, I must acknowledge that the violation of these assumptions may have led to reductions in the accuracy of prediction and decreased stability in discriminant weights (Betz, 1987, p. 401).

For development of the calibration model, I entered all predictor variables into the model simultaneously. The multivariate analysis of variance (Stevens, 1992, pp.225-226) revealed a statistically significant overall difference among the battery of discriminating variables across the four groups of students classified according to educational outcomes as of June 30, 1995 (Pillai's Trace = .769; Wilk's Lambda = .382; Hotelling's Trace = 1.250; $p < .001$ for all tests). Therefore, I conducted univariate F tests to determine if there were significant differences among the four groups for each one of the discriminating measures. Each of the ANOVA results was statistically significant at the .001 alpha level (3; 6,000 degrees of freedom), indicating that all of the discriminating variables were important in the final classification model–that is, that a reliable separation of the four groups existed based on all fourteen variables combined (Tabachnick & Fidell, 1996).

I then proceeded to look at post hoc pairwise comparisons for each of the variables across each of the groups. I used the Tukey procedure in order to allow for the examination of all pairwise group differences on each dependent variable while holding family-wise error rate in check (Glass & Hopkins, cited in Stevens, 1992, p. 203).

Table 24 in Appendix B displays the point estimate for each contrast and provides a 95% confidence interval, within which the actual value of the true contrast was likely to fall. These intervals indicated the precision with which the mean differences were captured, so I was able to use them to determine the practical importance of the results. Because I found little guidance in the literature regarding the establishment of thresholds to determine practical importance for these results, for dichotomous variables, I chose to use thresholds equal to 0.33 times the standard deviation of the second variable in the contrast (S_Y). For interval variables, I chose to use 0.10 times the quotient of the standard deviation of the second variable in the contrast (S_Y) divided by the standard deviation of the first variable in the contrast (S_X) (Tate, 1996, pp. 28-29).

Three classification variates (canonical discriminant functions) were derived in the analysis, all of which were statistically significant for classification purposes ($p < .001$), indicating I could reject the null hypothesis that the means of all three functions were equal in the four populations. As mentioned previously, Wilk's lambda was 0.382 when all functions were included, with χ^2 (42, n = 6,004) = 5,769. When the first function was removed, Wilk's lambda was 0.727, with χ^2 (26, n = 6,004) = 1,913. Finally, when the first and second function were removed, Wilk's lambda was 0.879, with χ^2 (12, n = 6,004) = 772. The first function accounted for 72% of the total between-groups variance in educational attainment outcome, the second function explained an additional 17% of the variance, and the third function explained an additional 11% of the variance.

Because the assumption of a multivariate normal distribution is important for tests of significance (Klecka, 1990, pp. 36-37, 62), I also examined the canonical correlation and the relative percent of variance accounted for by each of the classification variates. For the first variate, the canonical correlation (i.e., the multiple correlation between the predictors and the discriminant function), when squared, indicated that 48% of the variance was shared between groups and predictors on that function. The second canonical correlation indicated that 17% of the variance was shared between groups and predictors on the second function. Finally, 12% of the variance was shared between groups and predictors on the third function. These figures indicated sufficient importance for me to decide to include all three canonical discriminant functions in the analysis.

Table 10 contains the structure coefficients and the standardized discriminant function coefficients for the calibration model. The structure coefficients are the simple bivariate correlations between the variables and the discriminant function scores. For the first function, the group centroid (the average discriminant function score for each group for each function) was 0.45 for graduates, 0.73 for AA transfers who were still enrolled as of June 30, 1995, -1.31 for nonpersisters who left in good standing, and -2.27 for nonpersisters who left not in good academic standing. For the second function, the group

Table 10.
Model for Predicting Educational Attainment Outcomes (Calibration)

n = 6,004	Function 1		Function 2		Function 3	
Predictor Variable	Structure Coefficient	Standardized Discriminant Function Coefficient	Structure Coefficient	Standardized Discriminant Function Coefficient	Structure Coefficient	Standardized Discriminant Function Coefficient
Total Terms	.800*	.881	-.557	-.443	-.019	-.133
Degree Changes	.185*	.085	-.153	.056	.020	.043
First-Term GPA Δ	.333	.490	.530*	.628	.455	.490
Institution Change	.046	.031	-.321*	-.302	.133	.257
White	.019	.055	.152*	.028	-.084	-.077
Cohort	.058	.043	.140*	.072	-.081	.046
Black	-.027	.017	-.131*	-.061	.019	.006
Hispanic	-.002	-.001	-.095*	.044	.094	-.007
First-Term Load	.174	.287	.471	.397	-.704*	-.654
Birth Year	.050	.102	.024	.109	-.425*	-.111
Selectivity	.055	.135	.172	.140	-.355*	-.169
Enrollment Time Gap	-.083	-.022	-.009	.017	.320*	.153
College GPA	.154	.278	.241	.380	.285*	.394
Female	.047	.098	.133	.071	.174*	.047

* Largest absolute correlation between any variable and any discriminant function.

centroids were 0.19, -1.18, 0.35, and -0.45 for students who graduated, were still enrolled, left in good standing, and left not in good standing, respectively. Finally, for the third function, the group centroids were -0.12, 0.36, 0.77, and -0.64, respectively.

On the first function, the standardized discriminant coefficients revealed that the total number of terms attended during the period under study was the dominant variable, followed by the change in grade point average during the first term at the university; and first-term course load. Each of these variables had a positive value. The change in grade point average during the first term at the university (with a positive value) was the dominant variable defining the second function. This variable was followed by a negative value for the total number of terms attended during the period under study and a positive value for first-term course load. For the third function, first-term course load (with a negative value) was the dominant variable, followed by first-term change in grade point average and then by community college grade point average (both with positive values).

When I assumed prior probabilities of 65% for graduates, 10% for students who were enrolled at the end of the study, 15% for students who left in good academic standing, and 10% for students who left the System not in good academic standing, I attained an overall hit rate of 79% for the calibration sample and 78% for the cross validation sample. In the cross validation sample, the hit rates for graduates, still enrolled students, students who withdrew in good standing, and students who withdrew not in good standing were 93%, 29%, 49%, and 63% respectively. When I assumed equal prior probabilities, the overall hit rates dropped to 70% for the calibration sample and 68% for the cross validation sample. However, in the cross validation sample, the hit rates for graduates, still enrolled students, students who withdrew in good standing, and students who withdrew not in good standing were 71%, 66%, 57%, and 72% respectively, representing a decrease in the correct classification of graduates, but an increase in the correct classification of students in all other outcome categories.

Initially, these results might lead one to believe that the model is reasonably effective. However, it is important to inspect the hit rates for correct classification into specific groups. In both the calibration sample and the cross validation sample, the rates of correct classification were highest for the graduates and for nonpersisters who left the System with a cumulative grade point average less than 2.0. AA transfers who were still enrolled or who had left the System in good academic standing had a greater chance of being misclassified.

Final Model for the Entire Sample

Upon attaining acceptable rates of correct classification for the calibration and cross validation samples, I recombined the samples and ran a predictive discriminant analysis and the accompanying multivariate analysis of variance for the entire group of AA transfers. Point estimates and 95% confidence intervals for post hoc pairwise comparisons for each of the variables across each of the groups are in Table 11.

These contrasts provided information about the statistical differences among means for AA transfers in each of the final outcome groups. For instance, when I assessed how the AA transfers who left the State University System in good academic standing differed from the other groups of students, I discovered that the nonpersisters

TABLE 11.
Educational Attainment Outcome Group Contrasts -- Entire Sample

Contrast	Estimate	95%	Contrast	Estimate	95%
Gender (Female = 1)			**Hispanic**		
1 vs. 2^b	.07***	.03, .11	1 vs. 2^b	-.06***	-.08, -.03
1 vs. 3^b	-.06***	-.09, -.02	1 vs. 3^b	-.03***	-.06, -.01
1 vs. 4	.13***	.09, .17	1 vs. 4^b	-.02	-.04, .01
2 vs. 3	-.13***	-.17, -.08	2 vs. 3^b	.02	-.005, .05
2 vs. 4^b	.06**	.01, .12	2 vs. 4^b	.04**	.01, .08
3 vs. 4	.19***	.14, .24	3 vs. 4^b	.02	-.01, .05
White			**Birth Year**		
1 vs. 2^b	.09***	.06, .12	1 vs. 2^a	1.31***	.84, 1.78
1 vs. 3^b	.02	-.004, .05	1 vs. 3^a	2.46***	2.03, 2.89
1 vs. 4^b	.05***	.02, .08	1 vs. 4	-.42	-.92, .08
2 vs. 3^b	-.06***	-.10, -.02	2 vs. 3^a	1.15***	.57, 1.74
2 vs. 4^b	-.04	-.08, .007	2 vs. 4^a	-1.73***	-2.37, -1.09
3 vs. 4^b	.03	-.01, .07	3 vs. 4^a	-2.88***	-3.49, -2.27
Black			**Community College Grade Point Average**		
1 vs. 2^b	-.04***	-.06, -.02	1 vs. 2	.09***	.05, .13
1 vs. 3^b	.0003	-.02, .02	1 vs. 3^b	.001	-.03, .03
1 vs. 4^b	-.03***	-.05, -.01	1 vs. 4^a	.36***	.32, .40
2 vs. 3^b	.04***	.02, .06	2 vs. 3	-.09***	-.14, -.04
2 vs. 4^b	.005	-.02, .03	2 vs. 4^a	.27***	.22, .32
3 vs. 4^b	-.03***	-.06, -.01	3 vs. 4^a	.36***	.31, .41

1: Graduate
2: Still enrolled student
3: Nonpersister who left in good academic standing
4: Nonpersister who left not in good academic standing

* $p < .05$ ** $p < .01$ *** $p < .001^c$

[a] Determined to be of practical importance for the population with a threshold set equal to $(0.10)(S_y/S_x)$ for continuous variables and $(0.33)(S_y)$ for dichotomous variables.

[b] Determined to be of no practical importance for the population.

[c] Alpha was set at .001 because of concerns with violations of assumptions.

TABLE 11. (Continued)
Educational Attainment Outcome Group Contrasts -- Entire Sample

Contrast	Estimate	95%	Contrast	Estimate	95%
Time Gap			First-Term Course Load		
1 vs. 2[a]	-2.59***	-3.81, -1.38	1 vs. 2[a]	3.03***	2.77, 3.28
1 vs. 3[a]	-5.57***	-6.68, -4.46	1 vs. 3[a]	2.63***	2.39, 2.86
1 vs. 4	-.89	-2.18, .41	1 vs. 4[a]	1.47***	1.19, 1.74
2 vs. 3[a]	-2.98***	-4.49, -1.46	2 vs. 3	-.40**	-.72, -.08
2 vs. 4	1.70*	.05, 3.36	2 vs. 4[a]	-1.56***	-1.91, -1.21
3 vs. 4[a]	4.68***	3.10, 6.26	3 vs. 4[a]	-1.16***	-1.50, -.82
Selectivity			First-Term Change in Grade Point Average		
1 vs. 2[a]	13.88***	10.83, 16.94	1 vs. 2[a]	.31***	.26, .37
1 vs. 3[a]	13.59***	10.81, 16.38	1 vs. 3[b]	.04	-.01, .10
1 vs. 4[a]	4.45**	1.18, 7.71	1 vs. 4[a]	1.12***	1.06, 1.18
2 vs. 3	-.29	-4.10, 3.52	2 vs. 3[a]	-.27***	-.34, -.20
2 vs. 4[a]	-9.44***	-13.61, -	2 vs. 4[a]	.81***	.72, .89
3 vs. 4[a]	-9.15***	-13.12, -	3 vs. 4[a]	1.07***	1.00, 1.15
Cohort Group (Fall = 1)			Number of Requested Degree Changes		
1 vs. 2[b]	.12***	.09, .16	1 vs. 2[a]	-.20***	-.25, -.14
1 vs. 3[b]	.06***	.03, .09	1 vs. 3[a]	.24***	.18, .29
1 vs. 4[b]	.06***	.03, .10	1 vs. 4[a]	.32***	.26, .39
2 vs. 3[b]	-.06**	-.10, -.02	2 vs. 3[a]	.43***	.36, .51
2 vs. 4[b]	-.06*	-.10, -.07	2 vs. 4[a]	.52***	.44, .60
3 vs. 4[b]	.004	-.04, .05	3 vs. 4	.09*	.01, .16

1: Graduate
2: Still enrolled student
3: Nonpersister who left in good academic standing
4: Nonpersister who left not in good academic standing

* $p < .05$ ** $p < .01$ *** $p < .001$[c]

[a] Determined to be of practical importance for the population with a threshold set equal to $(0.10)(S_y/S_x)$ for continuous variables and $(0.33)(S_y)$ for dichotomous variables.

[b] Determined to be of no practical importance for the population.

[c] Alpha was set at .001 because of concerns with violations of assumptions.

TABLE 11. (Continued)
Educational Attainment Outcome Group Contrasts -- Entire Sample

Contrast	Estimate	95%	Contrast	Estimate	95%
Institution Change			Total Number of Terms Attended		
1 vs. 2	-.10***	-.12, -.09	1 vs. 2^a	-1.81***	-1.96, -1.67
1 vs. 3^b	.006	-.008, .02	1 vs. 3^a	2.73***	2.60, 2.86
1 vs. 4^b	-.003	-.02, .01	1 vs. 4^a	3.34***	3.18, 3.49
2 vs. 3^a	.11***	.09, .13	2 vs. 3^a	4.54***	4.36, 4.72
2 vs. 4^a	.10***	.08, .12	2 vs. 4^a	5.15***	4.95, 5.35
3 vs. 4^b	-.009	-.03, .01	3 vs. 4^a	.61***	.42, .79

1: Graduate
2: Still enrolled student
3: Nonpersister who left in good academic standing
4: Nonpersister who left not in good academic standing

* $p < .05$ ** $p < .01$ *** $p < .001^c$

[a] Determined to be of practical importance for the population with a threshold set equal to $(0.10)(S_Y/S_X)$ for continuous variables and $(0.33)(S_Y)$ for dichotomous variables.

[b] Determined to be of no practical importance for the population.

[c] Alpha was set at .001 because of concerns with violations of assumptions.

who left in good standing were, on average, almost two and one-half years older than the AA transfers who graduated by June 30, 1995. The nonpersisters, on average, delayed entry into the university almost six months longer than the graduates. They also tended to enter somewhat less selective universities, took between two and three fewer credit hours during the first term, were less likely to change majors as frequently, and attended between two and three fewer terms than the students who graduated within the specified time.

The nonpersisters who left the System in good standing also, on average, were older than those students who remained enrolled at the end of the study. They delayed entry into the System longer, requested fewer degree changes, and attended fewer terms.

Additionally, they were less likely to experience transfer shock upon entering the senior institution and less likely to change institutions.

However, the picture was somewhat different when I compared those AA transfers who left the System in good standing with those who left not in good academic standing. Those who achieved a cumulative grade point average of 2.0 or better were, on average, almost three years older and entered the State University System with a community college grade point average more than one third of a grade point higher. Those in good standing tended to delay entry into the System longer, to attend less selective institutions, to take a slightly lighter course load during the first term, and to experience less transfer shock. Also, those who left in good standing tended to persist somewhat longer than those who left not in good standing.

When I assessed the differences between those students who graduated in a timely fashion and those who still remained enrolled on June 30, 1995, I discovered that the graduates, on average, tended to be slightly younger, to enter the System more quickly after other postsecondary enrollment, to attend more selective institutions, to take a heavier first-term course load, to experience less transfer shock, and to request fewer degree changes. On average, the graduates attended 1.8 fewer terms than the still enrolled students during the time of this investigation.

The AA transfers who graduated by June 30, 1995, tended to enter the State University System with a grade point average more than one third of a point higher than those who ended up leaving the System with a grade point average below a 2.0. The graduates also achieved a change in first-term grade point average 1.12 points higher than those who eventually left the system not in good academic standing. Those in this latter category tended to have taken fewer hours during the first term, attended less selective institutions, and requested fewer degree changes than the graduates. The graduates, on average, attended more than three more terms than those who left not in good standing.

Likewise, on average, students who remained enrolled at the end of the investigation entered the System with higher grade point averages, experienced less transfer shock, requested more degree changes, were more likely to change institutions, and attended, on average, more terms than students who left not in good academic standing. They differed from the graduates in that they tended to be significantly older, to enroll for fewer hours during the first term, and to attend less selective institutions than the AA transfers who left the System not in good academic standing.

Table 12 contains the revised structure coefficients and the standardized function coefficients for the final model for the entire sample. For the first function, the group centroid was 0.44 for graduates, 0.72 for AA transfers who remained enrolled as of June 30, 1995, -1.21 for nonpersisters who left in good standing, and -2.26 for nonpersisters who left not in good academic standing. For the second function, the group centroids were 0.17, -1.16, 0.45, and -0.54 for students who graduated, were still enrolled, left in good standing, and left not in good standing, respectively. Finally, for the third function, the groups centroids were -0.13, 0.43, 0.68, and -0.55, respectively.

On the first function, the standardized discriminant coefficients revealed that the dominant variables remained total number of terms attended, the change in grade point

Table 12.
Final Model Predicting Educational Attainment Outcomes

N = 12064	Function 1		Function 2		Function 3	
Predictor Variable	Structure Coefficient	Standardized Discriminant Function Coefficient	Structure Coefficient	Standardized Discriminant Function Coefficient	Structure Coefficient	Standardized Discriminant Function Coefficient
Total Terms	.803*	.877	-.551	-.456	.022	-.107
Degree Changes	.187*	.080	-.136	.066	.043	.051
First-Term GPA Δ	.332	.489	.552*	.663	.415	.442
Institution Change	.050	.041	-.311*	-.271	.172	.295
College GPA	.169	.289	.282*	.423	.244	.358
Female	.032	.080	.175*	.110	.146	.026
Cohort	.037	.008	.147*	.099	-.143	-.010
White	.024	.059	.138*	-.063	-.075	.064
Black	-.020	.024	-.131*	-.104	.002	.062
First-Term Load	.175	.299	.401	.326	-.756*	-.690
Birth Year	.040	.090	-.004	.096	-.417*	-.098
Selectivity	.061	.123	.131	.118	-.346*	-.155
Enrollment Time Gap	-.066	-.013	-.009	.006	.306*	.147
Hispanic	-.016	.007	-.089	-.039	.136*	.120

* Largest absolute correlation between any variable and any discriminant function.

average during the first term at the university, and first-term course load—all with positive values. The change in grade point average during the first term at the university (with a positive value) remained the dominant variable defining the second function, followed by a negative value for the total number of terms attended during the period under study. For this model, a positive value for community college grade point average was next, followed by first-term course load. The third function was similar to that for the calibration model, with first-term course load (with a negative value) being the dominant variable, followed by first-term change in grade point average, and then by community college grade point average (both with positive values).

As mentioned previously, classification function coefficients (Table 13) provided the mechanical, mathematical means for predicting each student's final outcome group. Each individual was classified into one of the groups by calculating the student's linear discriminant score for each group. For instance, the value for a given AA transfer "j" relative to the graduate group was computed as follows: 19.60 (FEMALE$_j$) + 102.48 (WHITE$_j$) + 119.53 (BLACK$_j$) + . . . + 4.17 (TOTTERMS$_j$) - 63,315.05. The same procedure was used to obtain values for the other three groups, and then the student was estimated to belong to the group for which that student obtained the highest score. These classification function coefficients can be used to place future groups of AA transfers into estimated classification groups, as well.

Table 14 presents the final classification results for the final model in which I assumed equal prior probabilities (the model in which I was able to achieve higher rates of correct classification across the four outcome groups). One must assess the impact of

TABLE 13.
Classification Function Coefficients for Final Model

	Graduate	Still Enrolled	Nonpersister GPA ≥ 2.0	Nonpersister GPA < 2.0
Gender	19.60	19.38	19.44	18.98
White	102.48	102.82	102.32	102.12
Black	119.53	120.33	119.44	119.45
Hispanic	-.48	-.09	-.24	-.62
Birth Year	64.33	64.30	64.30	64.29
Community College GPA	191.44	190.84	191.29	188.84
Enrollment Time Gap	5.11	5.12	5.12	5.11
Institutional Selectivity	-.37	-.37	-.37	-.38
Cohort Group	12.21	11.92	12.23	12.02
First-Term Course Load	-21.10	-21.32	-21.39	-21.32
First-Term Change in GPA	86.27	85.62	85.92	83.70
Requested Degree Changes	-17.41	-17.46	-17.50	-17.78
Institution Change	-78.33	-75.62	-77.86	-78.55
Total Terms Attended	4.17	4.60	3.28	3.10
Constant	-63315.05	-63258.38	-63234.33	-63204.60

TABLE 14.
Classification Results for Final Model (Equal Prior Probabilities)[a]

Final Classification Group	Predicted Group Membership			
	Graduate	Still Enrolled	Nonpersister GPA ≥ 2.0	Nonpersister GPA < 2.0
Graduate	70.8%	20.2%	6.4%	2.6%
Still Enrolled	16.4%	66.8%	8.6%	8.2%
Nonpersister and GPA ≥ 2.0	21.3%	6.9%	57.4%	14.4%
Nonpersister and GPA < 2.0	11.1%	4.1%	12.3%	72.5%

[a] 68.8% of original grouped cases correctly classified.

misclassifications, depending on the purposes for which the model will be used. For instance, if the data are to be used to classify students who might benefit from academic support services, one would not want to devote excessive funds to students misclassified into the group with nonpersisters who left the System not in good academic standing.

Although an extensive analysis of the cases not fit well by the final discriminant analysis model was beyond the scope of this study, several observations were worth noting. Three groups of students were of special interest, particularly if the model might be used for intervention purposes: the students who left the System not in good academic standing but who were predicted to be in a different outcome group; the students who left the System in good academic standing, but who were predicted to persist; and the students who were predicted to graduate, but who actually remained enrolled at the end of the study.

Of the students who left not in good standing, those who were predicted to be in some other outcome group were more likely to be female than those who were correctly classified. They also were more likely to have entered with the fall cohort, experienced less transfer shock, requested more degree changes, and/or been more likely to change institutions during the study. The misclassified nonpersisters who did not attain good standing had a mean cumulative grade point averages of 1.60 (*SD* = .33) compared with 1.08 (*SD* = .60) for those who were correctly classified. On average, the misclassified students also attended more terms than the correctly classified students in this category.

The students who left the System in good academic standing, but who were predicted to persist, had community college grade point averages and/or cumulative grade point averages similar to those students who were accurately identified as nonpersisters who left in good academic standing. On average, they also attended a similar number of terms. However, they more frequently were younger, Black, and/or male. On average, these students who were misclassified as persisters experienced less delay prior to entry into the System and/or attended larger, more selective institutions than the correctly classified students in this category. They were more likely to enter with the fall cohort, take a heavier course load during the first term, experience more transfer shock, and/or receive more financial aid than the correctly classified nonpersisters who left in good standing. Finally, they requested more degree changes and/or were more likely to change institutions during the study.

When I compared those students who were predicted to graduate in a timely fashion, but who actually were still enrolled at the end of the study, with accurately classified graduates, I discovered that the misclassified students were more likely to be younger males who enrolled in smaller, less selective institutions during the spring term. These misclassified students had a mean cumulative grade point average of 2.65 (*SD* = .60) compared with 3.12 (*SD* = .48) for the correctly classified graduates.

Use of Intermediate Logistic Regression Results to Predict Final Educational Attainment Classifications

Because I had some concerns regarding the violation of assumptions for the predictive discriminant analyses, I decided to check how well the logistic regression models for intermediate outcomes could predict which AA transfers graduated, which were still enrolled as of June 30, 1995, which left in good standing, and which left not in good standing. By combining model results, I was able to obtain a model that predicted each AA transfer's status as of June 30, 1995. I chose to use the results from the graduation logistic regression model to predict student membership in the graduate category. I combined the results for prediction of nongraduates and of persisters to predict student membership in the category of AA transfers who were still enrolled at the end of the study. I divided out the students who left the System in good academic standing from those who left not in good standing by combining results from the persistence model and the academic standing model.

Using the results from the three final models for persistence, academic standing, and graduation, with the adjusted decision cut scores, I was able to correctly predict the outcome for (a) 73% of the students who attained the baccalaureate from the System during the specified time, (b) 21% of the students who remained enrolled in the System at the end of the specified time, (c) 36% of the nonpersisters who left the System in good academic standing and did not return to graduate or to remain enrolled at the end of the study, and (d) 72% of the nonpersisters who left the System not in good academic standing and did not return to graduate or to remain enrolled as of June 30, 1995. The overall correct classification rate was 62%.

This model still did a reasonably good job of classifying graduates and students who left the System not in good academic standing. However, it did not do well identifying students in the other two groups. The rates of correct classification were noticeably better for these two groups when I used the predictive discriminant analysis model.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

Introduction

The previous chapter provided a detailed explanation of statistical analyses designed to assess the relationship of AA transfers' individual attributes, as well as their pre-university academic experiences, transition factors, and academic integration, to persistence, academic performance, and baccalaureate degree attainment within a specified time. Then, a classification model was described that estimated whether AA transfers were graduates, still enrolled students, nonpersisters who left the State University System in good academic standing, or nonpersisters who left the System not in good academic standing. This chapter summarizes these research findings and the final set of prediction models and relates them to the review of the literature and to the conceptual framework for this study. Additionally, recommendations for future research, recommendations for practitioners, and conclusions are presented.

Summary of Findings

This study was designed to determine which selected predictor variables representing individual attributes and the theoretical constructs of academic background, transition, adjustment, and academic integration were significantly related to the persistence, academic standing, and timely graduation of AA transfers who entered the State University System from the public Community College System. Also of interest were the effects of these variables on the odds of student persistence, good academic standing, and timely graduation.

Those variables found to have a significant effect ($p < .05$) on at least one of the three outcomes included gender, age, community college grade point average, time gap between community college and university enrollment, average university Scholastic Aptitude Test score at the first university attended, term of entry, first-term course load, first-term change in grade point average, number of degree changes, and change of institution within the System. Of those variables found to be of both statistical significance and practical importance for the population were gender as it related to academic standing, age as it related to persistence and graduation, and first-term course load as it related to persistence and graduation. The odds of AA transfers attaining a grade point average of 2.0 or above increased if they were female. The odds of AA transfers persisting and graduating increased if they were younger and as their first-term course loads increased.

Community college grade point average, university selectivity, amount of positive change in grade point average during the first term at the university, number of requested degree changes, and whether the student changed institutions all had statistically significant effects of practical importance on all three intermediate outcomes. In all but one case, the odds of the desired outcome increased as the values for these variables increased. Controlling for the other variables in the model, the odds of a student who transferred between universities graduating within the specified time were 54% less than for students who remained at the same university. The determination of practical importance in the population of the other statistically significant effects in the models was inconclusive.

Another purpose of this investigation was to determine what differences existed among those AA transfer students who graduated, those who remained enrolled, those who dropped out in good academic standing, and those who left not in good academic standing. Graduates tended to be younger and to have entered the State University System following other postsecondary enrollment more quickly than those AA transfers who remained enrolled at the end of the study or who had left the System in good academic standing. On average, the graduates attended more selective universities (based on average Scholastic Aptitude Test scores), and initially enrolled for more credit hours than the other three groups of AA transfers. Graduates also entered the System with higher grade point averages and experienced less transfer shock than the students who left the System not in good academic standing. Finally, graduates attended more terms and requested more degree changes than the students who left the System, but attended fewer terms and requested fewer degree changes than those who were still enrolled at the end of the study.

Although no significant difference existed between the mean community college grade point averages for graduates and the mean for those who remained enrolled at the end of the study, the latter group of students experienced less of a positive change in grade point average during their first term in the university. When I compared the students who remained enrolled to the nonpersisters, I discovered that the former students tended to be younger than the students who left in good standing and older than the students who left not in good standing. Students who remained enrolled entered the university more quickly following prior postsecondary enrollment than those who left the System in good standing. On average, the still enrolled students attended less selective universities and initially enrolled for fewer credit hours than those students who left the System not in good academic standing. They experienced less transfer shock than those who left with academic difficulties, but more than the students who left in good academic standing. Finally, the still enrolled students requested more degree changes and were more likely to change institutions than both groups of nonpersisters, and they subsequently attended more terms during the time of the investigation.

Of the nonpersisters, those who left not in good standing were more likely to be younger, to have entered the university sooner after prior postsecondary enrollment, to have attended a more selective university, and to have enrolled for more hours during the first term than those who left in good standing. However, they requested fewer degree changes and attended fewer terms altogether during the time of the investigation. On average, those who left not in good standing had lower community college grade point averages and experienced more transfer shock than any of the other groups of AA transfers.

The classification scheme that was developed from the identified discriminating variables which allowed for the correct identification of the most students across the four groups was based on equal prior probabilities. This model correctly predicted outcomes for (a) 71% of the AA transfers who attained the baccalaureate from the State University System during the specified time, (b) 67% of the AA transfers who remained enrolled in the State University System at the end of the specified time, (c) 57% of the nonpersisters who left the System in good academic standing (cumulative grade point average ≥ 2.0) and did not return to graduate or to remain enrolled at the end of the study, and (d) 73% of the nonpersisters who left the System not in good academic standing (cumulative grade point average < 2.0) and did not return to graduate or to remain enrolled at the end of the investigation. The overall correct classification rate was 69%.

Discussion of Findings

Theoretical Framework

The findings from this study are best discussed within the context of the theoretical framework that guided the investigation: In many ways, the results from this study are congruent with Tinto's (1975; 1987; 1988) theory which incorporates Van Gennep's concept of "rites of passage" to explain the multivariate, longitudinal process of student persistence in undergraduate education. AA transfer students enter the State University System with a unique set of pre-university characteristics, including gender, age, and community college grade point average. All of these students have completed at least sixty hours of course work, acquired the Associate in Arts degree, and applied to and been accepted into the System. One could speculate that these variables might influence students' levels of commitment to graduating from the System with the baccalaureate degree.

The AA transfer students separate from a known institutional setting when they enter the university. Additionally, for many students who live at home while attending the community college, enrollment at the university represents a separation from families, and sometimes from communities, to enter the new environment. The transfers face a new set of challenges, because the universities often differ from the community colleges relative to campus culture, the nature of available support services, the rigor of the curriculum, and the level of competition among students.

Based on the results of this study, it is reasonable to assume that AA transfers enter a period of transition: What worked for these students in the community college setting may not work for them in the same way at the senior institution. Poor academic performance often signals adjustment problems. Evidence in this study suggests that some transfer students who attain acceptable grades also might experience some difficulty adjusting and becoming integrated into the new culture. Hughes and Graham (1992) have suggested that some students who begin their postsecondary careers at community colleges may lack confidence in their ability to succeed at a major university regardless of their abilities or personal backgrounds.

Multiple studies have offered support for the theory that a student's adjustment to an institution or the overall fit between a student and an institution can have an effect on persistence (e.g., Bennett & Okinaka, 1990; Braddock, 1981; Braxton & Brier, 1989; S. B. Eaton & Bean, 1995; Pantages & Creedon, 1978; Ramist, 1981). A student's fit and satisfaction with a chosen major also can influence persistence decisions. Sense of fit is influenced by a student's goals, preferences, personal style, satisfaction, perceived practical value of the degree, and ability to balance competing demands on the student's time and energy (Johnson, 1987).

The results from this study suggest that, when AA transfers perceive a less-than-satisfactory fit or they begin to experience academic difficulty, they frequently modify their goals–often by requesting a change of major or even by changing institutions within the System. However, for those students who do not find ways to adjust and do not become sufficiently integrated into the university environment, there exists a greater likelihood that they will leave the System prior to baccalaureate degree attainment.

As this investigation proceeded, it became increasingly clear that transfer students' integration, and possibly their commitment to graduating with the baccalaureate from a particular institution, can be influenced by their attendance patterns in postsecondary education. The experience for a young student who moves directly from high school through a community college and into a university can be quite different from the experience of an older individual who encounters interruptions in attendance (e.g., a delay between prior postsecondary enrollment and entry into the System) or who does not attend on a full-time basis. Other research (e.g., Ahson & Gentemann, 1994; Churchill & Iwai, 1981; Pascarella & Terenzini, 1991; Pascarella, Terenzini, et al., 1986) has reinforced the contention that this latter group of students is much more likely to experience conflicts with external demands such as family and work responsibilities. A major difference in this study and the works of several other theorists (e.g., Bean, 1985; Bean & Metzner, 1985; Cabrera et al., 1993; Nora, 1987,1996) is that I have made no attempt on this "first run" to capture environmental variables or socio-psychological variables in and of themselves.

Relationship of the Results with Earlier Research

This study, which included multi-institutional data extending over four years, identified as persisters both students who graduated from the State University System and students who remained enrolled in the System at the end of the investigation. The overall persistence rate of 76% far exceeded the rate reported in the Newlon and Gaither (1980) study in which only 38% of the junior transfers had graduated or were still enrolled after two years. The data were collected somewhat differently in the NCES (USDOE, 1997) study of transfer students, but the results were more similar with those of the current study. Although only 25% of the community college transfers who had entered as freshmen in 1989-90 had received a bachelor's degree by 1994, another 44% were still enrolled at a four-year institution, for an overall persistence rate of 70%.

The 65% graduation rate for AA transfers in this study was similar to the rate for those students included in the research conducted by Knoell and Medsker (cited in Ackermann, 1991, p. 212). These researchers found that 62% of the students who transferred as juniors completed their baccalaureate degrees within three years.

Gender. The earliest reviews of attrition/retention studies revealed that, in general, female college students were less likely to persist than male students, but that many of the women who withdrew left voluntarily as opposed to leaving for academic reasons. Subsequent studies indicated either little or no difference in attrition based on gender, or they reported mixed results (e.g., Astin, 1972; Cope & Hannah, 1975; Pantages & Creedon, 1978; Spady, 1970; Summerskill, 1962; Tinto, 1975).

In this study, the results were inconclusive as to the influence of gender on persistence and graduation. However, the odds of female AA transfers attaining a cumulative grade point average of 2.0 or better were 47% greater than the odds for males, controlling for other variables in the model. Overall, 91% of the females attained good academic standing, whereas only 85% of the males did so. Looking just at the transfer students who graduated, the mean cumulative grade point average for females was 3.17, whereas the mean for male graduates was 2.98. On average, more females left the System in good academic standing than males. Whéreas 57% of the entire sample were females, only 45% of the students who left not in good standing were female, but 63% of the students who left in good standing were female. These results are consistent with some earlier findings regarding undergraduate students in general (e.g., Pantages & Creedon, 1978) and transfer students specifically (e.g., Al-Sunbul, 1987; Holahan et al., 1983).

Ethnicity. Looking merely at the descriptive statistics in this study, one might conclude that Black and Hispanic AA transfers, like the minority college students in many other studies (e.g., Astin, 1982; Astone & Nunez-Womack, 1990, 1991; Bender, 1991; Gosman et al., 1983; Hodgkinson, 1992; Porter, 1990; Rendón & Matthews, 1989; Sedlacek, 1987), are less likely to persist and attain baccalaureate degrees than their White peers. However, once I controlled for the linear effects of the other variables in the models, I discovered that ethnicity did not account for a statistically significant difference ($\alpha = .05$) in the odds of persistence, good academic standing, or timely graduation from the System. When I conducted post hoc pairwise comparisons for different student outcome groups, even the statistically significant differences associated with ethnicity were not substantial enough for me to determine them to be of practical importance. Therefore, like a number of other researchers (e.g., Gossman et al.; Lenning et al., 1980; Voorhees, 1987), I have found that, when I control for the effects of other variables in the models, the differences by racial groups tend to disappear.

However, it is interesting to look at some related descriptive information regarding the attendance and progression patterns of minority subgroups of AA transfers, and interpretations should be made with these caveats in mind. Like Hood (1992) and Pascarella (1985), I found that a higher percentage of Black men than women, particularly younger Black men, left the System not in good academic standing. Of the students who left the System not in good academic standing, on average, Blacks entered the System with significantly lower grade point averages than White AA transfers or Hispanic AA transfers. Of the students who persisted (graduated or still enrolled), again the Blacks entered the System with significantly lower grade point averages than White or Hispanic AA transfers. Whites who persisted experienced less transfer shock than Blacks or Hispanics who persisted.

Of those AA transfers who did graduate, Hispanic students took longer to do so than students in other ethnic categories, and Black students who graduated took longer to do so than White students. However, these results were not because students in particular racial categories took more hours; they merely attended more terms. Based on first-term course load, the Hispanic graduates tended to enroll for fewer hours. The Black students who graduated had a statistically lower cumulative grade point average than the White and Hispanic graduates in the study. There was no significant difference in the cumulative grade point averages of the Hispanic graduates and the White graduates. The Hispanic graduates were significantly older than the White and Black graduates and were more likely to have delayed entry between community college and university enrollment. There was no significant difference in the ages or time delay for White and Black graduates. Among the AA transfers who graduated, the amount of transfer shock for Hispanics tended to be higher than for Whites.

These results suggest that, although the ethnicity variables themselves often were not statistically significant in this study, minority groups had a substantial representation in the high-risk categories associated with other variables. These differences are sufficient for me to recommend further study, in which separate models are developed for student subgroups, or models are designed that take these interactions into consideration.

Age. Most scholars have identified adult students as those who are 25 or older and traditional students as those younger than 25 years of age. Several studies of college students in general have found withdrawal to be greater among adults than among traditional-age students (Astin, 1975; Bean & Metzner, 1985; Greer, 1980). In this study, younger students had higher odds of persisting and graduating, but this variable fell out of the final academic standing model. There was no statistically significant difference in the mean age for AA transfers who graduated and those who left the

System not in good academic standing. However, there were statistically significant and practically important differences among all other final outcome groups. Of particular note were the students who left the System in good academic standing. On average, they tended to be two or three years older than students who graduated or who left the System not in good academic standing.

Students born in or before 1965 attained a mean cumulative grade point average of 3.07, whereas younger students attained a mean of 2.75. However, only 56% of the older students graduated within the specified time, whereas 68% of the younger students did so. Of the graduates, the older students had a mean cumulative grade point average of 3.35, and the younger graduates had a mean of 3.01.

These results suggest that older students who are not graduating often are influenced by something other than grades. Although I did not include specific personal and environmental variables in this study, one must remember that chronological age probably serves not only as an indicator of maturity, but also as a surrogate for correlates such as variation in life circumstances, marital status, dependents, attitudes toward primary roles and responsibilities, and hours of employment (e.g., Cleveland-Innes, 1994). For instance, Ahson and Gentemann (1994) indicate that the conflict between job and university responsibilities increases with age and is more likely to be mentioned as a reason for nonpersistence by those students with children than for those with no children.

Community college grade point average. Many researchers have concluded that past academic achievement is related to college students' persistence/withdrawal behaviors (e.g., Astin,1975, 1985; Lenning et al., 1980; Pantages & Creedon, 1978; Porter, 1990; Ramist, 1981; Tinto, 1975; Wolfle, 1985). Other authors also have reported the positive association of high school grades with baccalaureate degree attainment (e.g., Mingle, 1987; Nettles, 1984; Pantages & Creedon). Like Graham and Hughes (1994) and Townsend et al. (1993), I found that students with higher transfer grade point averages tended to be more likely to attain higher university grade point averages. Students with higher grade point averages upon entry into the System also had a higher odds of graduating within the specified time, a finding consistent with the findings of McNerney, Knight, Ropiak, Jacot, Gonsiewski, and Mayer (cited in Townsend et al.). Community college grade point average contributed a moderate amount of the discriminating power to the discriminant functions in the final model. In particular, there were statistically significant differences in the mean average for those AA transfers who left the State University System not in good standing and the mean averages for each of the other outcome groups.

Pascarella and Chapman (1983b) reported lower high school grades for students who withdrew voluntarily from four-year commuter institutions; Getzlaf et al. (1984) found similar results at a public residential university. However, Pantages and Creedon (1978) found that high school grades seldom correlated as highly with student withdrawal from college as it did with persistence. In the current study, the difference in the mean community college grade point average for graduates and AA transfers who left the System in good academic standing was trivial, and the difference between the mean community college grade point average for those who remained enrolled at the end of the study and those who left in good academic standing was statistically significant, but the determination of practical importance for population effect was inconclusive.

In Knoell and Medsker's study (cited in Ackermann, 1991, p. 212), transfers who withdrew before degree completion entered the junior year with a lower community college grade point average than the students who remained enrolled or graduated. In the current study, however, the results were somewhat different–perhaps because I differentiated between those students who left in good academic standing and those who did not. The students who left the State University System not in good standing entered with lower grade point averages than students in all of the other categories. However, there was no significant difference, no practical difference, or inconclusive practical difference in the averages among other groups. These findings suggest that there are factors other than prior academic achievement that influence students' subsequent decisions regarding withdrawal from university studies.

Delays in enrollment. Researchers have reported that the continuity of students' college experiences can influence student persistence and degree attainment. Often, delays in entering college have had statistically significant negative effects on these outcomes (Carroll, 1989; Kempner & Kinnick, 1990; Nunley & Breneman, 1988; Robertshaw & Wolfle, 1983). In the intermediate models developed in this study, I looked at the time gap between prior postsecondary enrollment and enrollment in the State University System. Any statistically significant effects in the intermediate models were insufficient for me to be convinced of their practical importance. However, I was able to identify practically important differences in the mean amount of delay for those students who left in good academic standing and the mean amount of delay for students in the other outcome groups. On average, those who left in good standing had delayed from three to six more months than the other students.

Institutional size. Some researchers have contended that one important aspect of a student's transition into and experiences in a university is how that student makes sense of the new environment. These authors have posited that institutional size may be particularly important in adjustment to the university because it may contribute to a student's feelings of anonymity, sense of community, and level of isolation. However, reports related to the influence of institutional size on educational attainment have contained inconsistent and at times contradictory conclusions (e.g., E. F. Anderson, 1984, 1987; Pascarella & Terenzini, 1991; Stoecker et al., 1988). In this study, size was considered in a binary fashion only, with the division of universities set quite high (15,000 headcount). Under these circumstances, when I controlled for the linear effects of the other variables, institutional size did not have a significant enough effect on persistence, performance, or timely graduation to be included in the final models. One explanation for the lack of effect for institutional size may have to do with the correlation between size and selectivity. Some of the largest universities in the study also were the most selective. Thus, once I controlled for selectivity, I found little variation associated with size. Another possibility is that, upon attaining the Associate in Arts degree and enrolling in a university, community college transfer students may have an increased commitment to attaining the baccalaureate. If so, the influence of size might be somewhat mitigated by this increased commitment.

Institutional selectivity. Some researchers have asserted that college selectivity, which represents the general level of academic ability among the student body, may pose academic adjustment challenges for students (e.g., Attinasi, 1989; Hurtado et al., 1996; Pascarella & Terenzini, 1991). However, like E. F. Anderson (1984, 1987), Ethington and Smart (1986), McClelland (1990), Pascarella et al. (1987), Ramist (1981), and Stoecker et al. (1988), I found that the measure I had chosen to represent university selectivity (average composite Scholastic Aptitude Test score at the first university attended) was significantly and positively related to degree attainment. This finding existed even after I controlled statistically for other variables, including community college grade point average and the change in grade point average during the first term in the university. A significant and positive relationship existed for the persistence and academic performance models, as well. To explain this kind of finding, Lenning et al. (1980) and Tinto (1987) reported that the increased selectivity of an institution can increase student commitment to an institution, and therefore influence student persistence and degree attainment.

Cohort group. The literature review produced few references to the effects of time of entry into a university (fall versus spring term) on educational attainment outcomes. Plenty of anecdotal data suggest that the kinds and amounts of support services in place for students who enter on the traditional timetable can be quite different from the services provided for those who enter at a different time. In Florida, university personnel know that there will be substantial numbers of students entering during each term. However, I did not survey institutions as a part of this study to determine how much variation in support services might exist from term to term.

In any event, the variable designating cohort group had sufficient statistical significance in each of the intermediate models to be included in the final iterations, but population effects in these models, as well as in the comparisons among final outcome groups, were inconclusive or of no practical importance. Other variables in the models might have been capturing some of the same effect. For instance, for some students, a spring entry would represent a time gap between community college and university enrollment. Transfers who came in with the spring cohort also tended to be older, to have attended less selective institutions, and to have enrolled for fewer hours during the first term. All of these variables were found to influence educational attainment behaviors.

First-term enrollment status. Confirming the importance of first-term enrollment status on educational attainment (e.g., Knoell & Medsker, cited in Ackermann, 1991, p. 212; Lenning et al., 1980), an increase in the AA transfers' first-term course load increased the odds of persistence and graduation. For each additional three-hour course, the odds of persistence increased by 43%, and the odds of graduation increased by 80%, controlling for the other variables in each of the models. Part-time attendance may be associated with competing demands for the students' time and energy that were not included in this study. For instance, Ahson and Gentemann (1994) have reported that part-time students are more likely to list a conflict between work and school as a reason for withdrawing.

Financial aid. Knoell and Medsker (1965) reported that transfer students who drop out of college usually indicate that a lack of money is the primary reason for their decision. Dougherty (1987) suggested that the lack of financial aid often causes students to drop out because it forces them to take jobs, which also interfere with their social and academic integration into the four-year institution. In the current study, I only included information about whether AA transfers received financial aid during their stay at the university. I did not include any variables that would represent their financial status in a more comprehensive manner. The effects of financial aid both in the first term of enrollment and in subsequent terms were not statistically significant (controlling for the other variables) and were not included in the final educational attainment models.

Transfer shock. Numerous investigators have found a college student's grade point average at the end of the first term to be a notable indicator of adjustment to the intellectual demands of a college or university and an equally important predictor of persistence and eventual degree attainment (e.g., Aitken, 1982; K. L. Anderson, 1986; Bean, 1980; Cohen & Brawer, 1982; Ethington & Smart, 1986; Hills, 1965; Hilton, 1982; Holahan et al., 1983; Hughes & Graham, 1992; Johnson, 1987; Kintzer & Wattenbarger, 1985; Kissler et al., 1981; Knoell & Medsker, 1965; Lara, 1981; Pascarella & Terenzini, 1991; Spady, 1971; Stoecker et al., 1988; Tinto, 1982; Young, 1982; Zimmerman, 1981). Pascarella and Terenzini have suggested that, as a measure of academic adjustment, grades serve not only as an indicator of the requisite intellectual skills, but also as an indicator of personal motivation, desirable attitudes, organization, study habits, and quality of effort (p. 388).

Consistent with much of the research conducted on transfer shock, this phenomenon was evident in this study. Of the AA transfers under investigation, 59% experienced transfer shock during their first term in the State University System. They experienced an average decline of 0.26 in their grade point averages. Although many researchers have collected data differently and have not restricted their investigations to students who attained the AA degree prior to transfer, they also have found evidence of transfer shock. In one study, Hills (1965) reported that 69% of the students experienced transfer shock. Knoell and Medsker (1965) and Doucette and Teeter (1985) reported an overall average decline in grade point average of 0.3 points during the first term after transfer. Pounds and Anderson (1989) found an average grade point average decline of .08. Diaz (1992) conducted a meta-analysis of 62 studies which revealed that students in 49 (79%) of the studies experienced transfer shock; the decline tended to be one-half grade point or less.

In this investigation, I found that when I controlled for other variables (including previous postsecondary performance), the change in grade point average from prior enrollment to university enrollment differentiated among groups, except for between graduates and those students who left the System in good standing. In this study, 13% of the students who experienced transfer shock withdrew from the System, even though they were still in good academic standing. These results confirm the relationship between college grades and attrition that has been consistently reported (Summerskill, 1962; Pantages & Creedon, 1978; Pascarella & Terenzini, 1991), but does not generalize to voluntary dropouts as it did in the study conducted by Getzlaf et al. (1984).

Summerskill (1962) pointed out quite some time ago that poor grades were a far more stable predictor of attrition than good grades were a predictor of retention, because successful students drop out in larger numbers than expected. This finding may be related to one of Tinto's (1987) dimensions of academic integration: perceived academic and intellectual development. If a student perceives too great a decrease in performance (i.e., evidence of a lack of development), that student may withdraw. In some cases, students make this decision even though their grade point averages continue to exceed 2.0. Apparently, for some students, experiencing even a small amount of transfer shock can be quite a devastating event. Their self-confidence is shaken, and they choose not to continue their undergraduate studies.

Other students appear to respond to transfer shock in a different manner. Sometimes, they change majors or even institutions, but they find a way to recover from the transfer shock or, at least, to maintain an acceptable grade point average. For instance, in the House (1989) study, students experienced a decline in grade point averages immediately after transfer, but the grade point averages of continuing transfer students rose after the first semester to regain equality with the grade point average performance of continuing native students. In this study, 61% of the AA transfers who experienced transfer shock still went on to graduate within the specified time, with another 12% still enrolled, for a total of 73% (compared to the 84% persistence rate for those who did not experience transfer shock).

Number of requested degree changes. A number of researchers have conducted studies that have provided supporting evidence to indicate that a student's level of certainty about academic major is positively related to persistence in college. (See Bean & Metzner, 1985.) For instance, in the Knoell and Medsker study (cited in Ackermann, 1991, p. 212), one of the major reasons cited for not graduating within the specified time period was changes in degree choice. This study of AA transfers, however, produced an interesting and unexpected finding: The number of requested changes of degree was positively associated with persistence, performance, and timely graduation.

As a way of explanation, it might be possible that some students have a strong enough commitment to graduating–and more specifically to graduating from a specific institution or from the State University System–that they choose to change majors and stay in the System as opposed to leaving the System. These study results raise some questions for those administrators and policy makers who seem intent on rushing students to choose and stick with a major. At least for AA transfers, one or two requests for a major change do not seem to adversely affect hoped-for outcomes.

Institutional change. Some researchers have shown that interruptions in a student's college career also negatively influence degree attainment. After statistically controlling certain background and aspiration variables, Robertshaw and Wolfle (1983) found that interruptions in one's college attendance had statistically significant negative effects on the number of years of college completed. Additionally, researchers have discovered that the continuity of students' college experiences can influence degree attainment. In particular, evidence has suggested that students who transfer among institutions have been less likely to persist and graduate (Kocher & Pascarella, 1990; Pascarella, 1985; Pascarella & Terenzini, 1991; Tinto, 1987).

In this study, I discovered that a change in institution had a statistically significant negative influence on baccalaureate degree attainment within the specified time, but actually had a positive influence on persistence and academic standing. The reader is reminded that these analyses had data limitations, because the ratio of the number of students who remained at the same institution to the number who changed institutions was greater than 10 to 1. Therefore, the students in the smaller category could exert more influence on the results (Rummel, 1970). Further study is recommended in this area.

The results at least raise the question as to whether there are students who, when they perceive a poor fit with an institution, demonstrate more motivation and seek out a university that is a good fit for themselves. Other students without this level of motivation or commitment to attaining the baccalaureate might be more likely to simply withdraw. One other possible explanation for why institutional change within the System is not adversely associated with attrition may be the existing articulation agreements within the State of Florida. Students have assurance that a large portion of their course work will transfer to a different institution in the System. They may feel like they have more options than students in another state might.

Total number of terms attended. Female graduates moved through the System more quickly than males, attending an average of 6.33 terms as compared with 6.57 terms for males. Of the AA transfers who graduated during the investigation, 59% of the White students, 47% of the Black students, 41% of the Hispanic students, and 50% of the "Other" students did so in six or fewer terms. Older graduates took, on average, longer to finish than younger graduates. These findings were consistent with general findings regarding the progression of students through undergraduate programs (USDOE, 1995).

Implications for Future Research

The results from this exploratory study merely provide an initial foundation for understanding the educational attainment patterns of AA transfers and predicting which of these students will persist in good academic standing and graduate in a timely manner. As mentioned at the outset of this investigation, the goal has been to determine if variables for which data were available at the System level were significantly related to educational attainment outcomes and how well the selected variables could predict outcomes for AA transfers. I recommend additional research to determine if there are other variables that would further explain the educational attainment patterns of these students.

Several limitations to this study must be kept in mind when interpreting results, and should be addressed in future studies. The prediction results indicate that the final models were least effective in predicting who remained enrolled at the end of the specified time or who left in good academic standing. Further study is needed to understand the characteristics and experiences of those students for whom the models did not accurately estimate outcomes. Additionally, a study is needed in which the sample is chosen through a stratified random sampling procedure to eliminate extreme ratios of students relative to certain variables (i.e., race, institutional change). Then, more clarity can be gained as to the relative effect of these variables on outcomes. Also, a follow-up analysis should be conducted to determine how much these models might have been influenced by external factors like the arrival of Hurricane Andrew in South Florida in 1992.

The educational attainment patterns for these same cohorts of students should be studied over a longer period of time to ensure that students are not labeled as "unsuccessful" who merely took longer to complete the baccalaureate due to external circumstances. In these extended studies, adjustments should be made to the models so that fall entrants and spring entrants are tracked for equal amounts of time. There also is the need to track students who enrolled in private institutions or out-of-state institutions and completed their baccalaureate requirements there.

These models also should be tested using AA transfers from subsequent years. Several substantial changes have taken place in the State of Florida since the initiation of this investigation that might influence educational attainment patterns. For instance, the State has implemented a new system of limited credits hours for baccalaureate degrees and common prerequisites for baccalaureate programs throughout the System (Florida Statute, 240.115). Florida universities are beginning to offer more baccalaureate degree options on community college campuses through projects that rely on the joint use of facilities. This change could have a tremendous effect on future attainment patterns for AA transfers, because the students will continue their studies in familiar environments. It will be important to conduct analyses of the influences of these new methods of delivery.

These models of undergraduate educational attainment should be tested using AA transfers from institutions in other states and university systems. The persistence, performance, and progression patterns may be quite different in states or institutions that do not have the kind of articulation agreements that exist in Florida. Because many students transfer into universities prior to attaining the Associate in Arts degree, it also might be valuable to run similar studies for these students, as well as comparative studies to capture the differences in educational attainment patterns for those transfers with the AA and those without the AA.

More sophisticated models should be tested, including models that capture some of the personal, psychological, environmental, organizational, and intervening factors that might influence transfer students' progression, persistence, and achievement (Cabrera et al., 1993; Dougherty, 1987; Pascarella & Terenzini, 1991). The quantitative measures used in this study need to be supplemented with well-designed ethnographies, case studies, survey research, and sensitive interviews. These methods may shed light particularly on the relative effects of internal and external factors that influence the educational attainment of AA transfers but cannot be captured through data available at the System level.

For instance, Noel et al. (1987) have presented several themes related to student attrition that deserve further study but for which data may not exist on System databases: academic boredom and uncertainty about what to study, transition/adjustment problems, limited and/or unrealistic expectations of college, academic underpreparedness, incompatibility, and irrelevancy (p. 10). Bean and Metzner (1985) have suggested consideration of variables that capture students' finances, hours of employment, outside encouragement to complete the baccalaureate, and family responsibilities. Students' socioeconomic status, level of involvement at the community college, and the distance between the community college attended and the university attended also might be of interest (Kinnick & Kempner, 1988). Peer relationships, extracurricular involvement, use of college facilities, residence, orientation and advising, and on-campus work all have been positively associated with persistence for some student populations (Churchill & Iwai, 1981; Pascarella & Terenzini, 1991; Pascarella, Terenzini, et al., 1986). Now, researchers need to assess their effects for AA transfers.

Many of the AA transfers who left the System not in good academic standing appeared to have entered the universities with weaker academic backgrounds. Questions arise as to the nature of these students' high school and community college academic experiences: Is there a long-term history of lower performance (i.e., low high school grade point average in addition to a low community college grade point average)? What is the nature of the community college curricula taken by these students? In particular, which English, mathematics, and science courses do they take, and how well do they perform in those courses (Phlegar et al., 1981)? What kinds of learning strategies and study skills do these students develop prior to entry into the universities? How do these students perform on the College Level Academic Skills Test (Florida State Board of Community Colleges, 1991, 1996)?

In this study, an assumption was made relative to students' commitment to attaining the baccalaureate from the State University System. Researchers should conduct studies that better assess students' levels of commitment upon entry into the System. Relatedly, the issue of requested degree changes raises interesting questions for further research. How certain are AA students at different points during their postsecondary careers of their goals and choices of majors (Kinnick & Kempner, 1988)? How strong are the intentions and commitments of the AA transfers to complete the baccalaureate or to graduate from a particular State university? Does a stronger commitment of this sort compensate for less certainty about degree major to the point that students will try out different degree majors until they find ones that work for them personally and still allow them to reach their goal of attaining the baccalaureate from a particular institution?

Actually, a great deal more study could focus on students' choice of major. Are AA transfers in particular majors more likely to persist and achieve? How realistic are the AA transfers' choice of majors upon entry into the State University System? Do particular curricula at the community colleges prepare AA transfers for success better than others–again, particularly in specific majors? In the State University System of Florida, there are certain baccalaureate programs that are designated as "limited access" and frequently have higher admissions standards than other programs (Florida Statute, 240.2097). In a follow-up study, it would be worthwhile to track which AA transfers aspired to enter limited access programs, which ones entered them initially or later during their stay at a university, and which ones changed majors from limited access programs to other programs.

In this study, I focused on academic integration and not on social integration. Questions still exist relative to the importance of social contacts and contacts with faculty outside of the classroom for these AA transfers. How involved are the AA transfers in life at the university (Astin, 1984)? How important is social integration for older versus younger students? How important is social integration for AA transfers who commute? What is the role of faculty-student interaction on the persistence behavior of AA transfers? For instance, the Myers study in Minnesota (cited in Noel et al., 1987, p. 21) demonstrated that the majority of students who did not have some kind of significant contact with an advisor, a residence hall counselor, or faculty member during the first three weeks were not enrolled for the succeeding year. However, like so many studies, these results were related to the freshman year experience. Is it important for transfer students to have similar kinds of experiences when they make the transition from the community college to the university? Are the first two, three, or six weeks also critical for this student population? If so, what kinds of contacts, and with whom, seem to be important? And what kinds of experiences make a difference?

Although I noted no statistically significant differences of practical importance among outcomes based on a student's ethnicity when I controlled for the effects of other variables in the models, I believe that further study of this variable deserves consideration. When one looks just at the descriptive statistics for different racial groups broken out by age and gender, one senses that there may be some interaction effects. Additionally, even though the effects may dwindle when other variables are taken into consideration, the actual numbers and percentages of AA transfers from underrepresented populations that do not persist to graduation deserve consideration. This assertion is particularly true when one realizes that a substantial number of the minority AA transfers fall into other high-risk categories (e.g., lower community college grade point average and more transfer shock for young Black males; delayed entry and part-time attendance for older Hispanic females).

A substantial number of Black AA transfers attended the historically Black institution in the System, and a substantial number of Hispanic AA transfers attended the predominantly Hispanic institution in the System. Further study is needed that takes into consideration institutional effects at predominantly White, Black, and Hispanic universities. For instance, Thompson and Fretz (1991) contend that some Black students at predominantly White institutions develop adaptive strategies for coping with the dominant culture at the university. They suggest that more studies be conducted "combining traditionally studied variables with bicultural adaptive variables using longitudinal methods and nonlinear causal modeling approaches to explore the relative contribution of each to the prediction of adjustment" (p. 447). Similar studies should be conducted relative to retention and academic success rates (Astin, 1982, p. 212).

Actually, it might be valuable to disaggregate data by student type, performing separate analyses using not only such groups as ethnic minorities, but also older students, part-time traditional age students, and full-time traditional age commuters. Researchers might design future studies to estimate the strength of the interaction effects between background and adjustment variables in affecting educational outcomes.

Models should be designed and tested that capture nonlinearity between the outcome variables and the predictor variables (Hosmer & Lemeshow, 1989, pp. 88-91).

Several results from this study left me suspicious that there might be significant intergroup differences based on the first university attended. Therefore, I recommend the development of separate models for individual institutions or, better yet, the development of hierarchical models that capture effects for subpopulations of AA transfers, particularly students at universities with particular characteristics coming from feeder community colleges with particular characteristics.

Once researchers and practitioners know how to identify those AA transfer most at risk, they need to test and compare the relative effectiveness of strategies to reduce the levels of risk. They need to develop systems for the ongoing monitoring and evaluation of which AA transfers are succeeding and which programs are succeeding in helping students persist and achieve. University personnel need to conduct more research on special programs and intervention strategies that have been implemented to improve the persistence and educational attainment of particular student populations.

Researchers need to continue to develop valid and reliable instruments for accessing information about some of the factors not currently captured on System data files. Finally, this study underscores the need to improve and link institutional, state, and national databases. In particular, data from different educational sectors need to be accessible to develop longitudinal studies that follow students from high school through the community college and into the university and beyond. A relational database containing more socioeconomic information, employment information, and family information that could be linked with existing System files might prove to be extremely valuable in capturing some of the other factors which influence AA transfer attainment patterns.

Implications for Practitioners

This study's findings have practical importance for educators and administrators who work with AA transfers. Researchers can take the models developed in this study and determine how well they work for a particular university or university system. Additionally, they can use the same variables to conduct new analyses with AA transfers coming into their institutions or systems. Finally, depending on the perceived return on investment, these researchers can test other meaningful variables for possible addition to the models and can adjust cut scores to optimize prediction rates for those students most at risk.

Then, practitioners can choose the educational attainment models best suited for the given situation to predict which AA transfers are most at risk of not achieving the desired outcomes. At this point, university personnel can shift their attention from prediction to prevention and conduct further assessments to determine these students' special needs (Pantages & Creedon, 1978). In general, authors have concurred that some of the potential obstacles for transfer students include their lack of adequate academic preparation (Dougherty, 1987; Townsend et al., 1993); complex and rigid admission procedures (Castillo, 1984; Pascarella & Terenzini, 1991); students' perceived lack of help in the transfer process (Townsend, 1993); discrepancies and variance in the transfer of course credit (Cohen & Brawer, 1989; Dougherty, 1987; Hatfield & Stewart, 1988;

Hendel et al., 1984; Peterson & Bailey, 1986; Remley & Stripling, 1983; Rendón & Matthews, 1989; Richardson & Bender, 1987; Swift, 1986; Townsend et al.); changes in grading practices and academic expectations from the junior to the senior institution (Richardson & Bender); students' adjustment to the new environment, which can frequently be a large, senior institution (Diaz, 1992; Rendón & Nora, 1988); and the lack of financial resources (Castillo; Townsend). Once practitioners have identified the prevalent student needs and the potential barriers to success in a given university or system, they can proceed with efforts to provide the right balance of improved campus programs, services, curricula, practices, attitudes, and environment to increase these students' chances for success (Jones & Watson, 1990; Noel et al., 1987; Pantages & Creedon; Pascarella & Terenzini; Rendón & Matthews; Tinto, 1987).

Educators need to distinguish among forms of nonpersistence, because not all forms of departure should be treated in the same manner, or are even of equal concern to universities or a university system. Additionally, the strategies that are going to be most effective in improving AA transfer persistence, timely progression, and degree attainment are probably going to be those that focus directly on the needs of particular student groups (Noel et al., 1987). For example, some students need much more assistance related to improving their academic skills and performance. Others need assistance dealing with competing university and external demands. Still others need more early assistance in identifying appropriate majors and meaningful career goals.

The results from this study suggest that different student groups might have different experiences that influence their decisions to persist or not persist in the State

University System. For instance, there are those students who appear to enter the State University System with weaker academic backgrounds and who find it difficult to meet the academic demands of the upper division. Then, there are those transfers who enroll, perhaps with higher community college grade point averages, but who experience some decrease in their grade point averages during their first term at the university. This decrease often is not so great that they are placed on academic probation, but they choose to leave the System anyway.

Another group of students does not persist, or if they do, they appear to progress through the System at a much slower pace. Many of these students seem to be the ones who have postsecondary experiences that include more interruptions and discontinuity. Frequently, they are older, delay entry into the State University System after prior postsecondary enrollment, and attend on a part-time basis after entry.

Questions still remain as to how much impact an AA transfer's financial situation might have on persistence patterns. The findings from this study support earlier findings about the relationship between the continuity of students' experiences and persistence and subsequent degree attainment. More research is needed to determine how much of a role finances play in AA transfers' attendance patterns. If financial constraints are a primary reason for the disruptions in students' attendance, policy makers may want to consider this information when they make decisions regarding financial aid options for AA transfers.

Anderson (in Noel et al., 1987) contends that, in designing specific strategies to promote persistence and achievement, practitioners need to think about how powerful various treatments, services, or programmatic efforts are. Moreover, they need to differentiate those treatments or services that tend to promote persistence from those that tend to promote academic achievement. Such distinctions can help university personnel make better resource decisions and identify areas that deserve attention.

For those students who seem to encounter adjustment difficulties, several support services deserve consideration. First, one must remember that students' pre-university educational experiences influence their transition and adjustment to the senior institution. It is important for university personnel to work with individuals at the elementary schools, secondary schools, and community colleges to develop a more integrated educational continuum. By working together to strengthen the educational system at all levels, policy makers and educators can increase all students' chances for academic success at the university level. Additionally, they can encourage students to strive for higher academic standards at each point along the way and provide them with the support to do so. Rendón and Nora (1988) have recommended that "efforts that promote intersegmental collaboration among the K-12 system, community colleges, and senior institutions should receive state support. Coordinated action that can arrest the leaks in the pipeline are needed at every juncture" (p. 23).

Much can be done at the community college level to increase rates of success for AA transfers. Improved outreach programs, career counseling, and academic advising should reduce AA transfer attrition. Improvement in academic advising is one of the most frequently recommended and implemented interventions for increasing retention (Beal & Noel, 1980; Lenning et al., 1980; Noel, 1985). Metzner (1989) contends that high-quality advising can help students clarify their educational goals and relate these goals to the curriculum. Additionally, advisors can encourage academic success by assisting students with the selection of course work that is compatible with their interests, abilities, outside commitments, and career aspirations. In particular, they can help prospective transfer students choose courses of study that best prepare them for subsequent course work at the university.

Because researchers consistently have shown prior academic achievement to be a strong predictor of subsequent achievement, it is important for community college practitioners to do what they can to help their AA students attain higher grades prior to transfer. Outreach programs that focus on the development of basic skills, study skills, and higher-order thinking skills can be of value. Additionally, researchers are encouraged to do more to understand which factors are influencing AA student performance most strongly while these students are still at the community college. Finding ways to improve their performance at this stage should have a positive influence on subsequent performance.

Community college personnel may want to consider developing "Transfer Preparation" courses or workshops for AA students. Such programs could help the AA students develop the skills and strategies necessary for successfully negotiating their way to and through the university. Areas of emphasis should include the development of note-taking skills, critical reading skills, writing skills, presentational skills, test preparation skills, and related metacognitive skills needed for mastering upper-division course work. Transfer students often find that their university experiences differ substantially from what they expected. Graham and Hughes (1994) contend that transfer students need to understand that the campus and student cultures will be different and develop skills necessary to enhance their success. Therefore, another very important component of transfer preparation activities should be to help the prospective AA transfers define realistic expectations regarding the upper division at the university so that they do not become disappointed with their efforts (Vaala, 1989).

It is particularly important to help these students define realistic expectations regarding performance during the first term at the university. With the majority of AA transfers experiencing some degree of transfer shock, it is important to make sure students are aware of this trend. However, it is even more important to let them know just how many of these students still go on to improve and complete baccalaureate degree requirements.

Much can be done at the university as well to enhance achievement and persistence among AA transfers. Unfortunately, many senior institutions lack sufficient orientation programs designed specifically for transfer students. Much of the advising for transfers is weak, and many clubs focus their recruitment on freshmen. Moreover, many other extracurricular activities are designed with freshmen in mind (Diaz, 1992; Dougherty, 1987). Universities should offer mandatory and separate orientation programs for AA transfers, if possible. The needs of transfer students appear to be sufficiently different to warrant this arrangement. Also, although the effects of date of entry were inconclusive in this study, I still recommend that universities pay particular attention to the orientation and academic support services available to AA transfers who enter with the spring cohort. Too frequently, the quality and quantity of services for these students are lacking.

Early contact with advisors is recommended. In addition to the benefits mentioned above with respect to community college advisors, university advisors can help establish a personal bond between a student and personnel of the university. Additionally, they can facilitate referral to other services and programs at the university. In this study, a student's enrollment status as a part-time or full-time student was related to persistence, performance, and timely graduation. It is possible that this variable, to some extent, reflects the priority that students assign to attending the university relative to other factors in their lives (Metzner & Bean, 1987). For nontraditional AA transfers in a particular, a variety of factors compete with academic work for the students' time and energy. Counselors or advisors might improve retention by helping individual students evaluate personal options, motivation, academic aptitude, and institutional resources. When feasible, these counselors and advisors could encourage students to take heavier course loads.

Within the last decade, administrators have developed freshman-year experience programs directed at easing students' transition from high school to college as a means of reducing attrition rates during the first year (Upcraft, Gardner, & Associates, 1989). However, only a few colleges and universities have initiated "transfer experience" programs for community college transfers (Hurtado et al., 1996). Such extended orientation programs could provide a needed support for AA transfers during their first term at the university.

Other intervention strategies worth considering include learning strategy workshops designed specifically to address the needs of transfer students; early warning systems to make sure that students experiencing academic difficulty at midterm take advantage of intrusive counseling, advising, and academic support services; tutoring programs; transfer mentoring programs; support programs associated with high-risk courses that not only assist students with the content of these courses, but that also help them to continue to develop the higher-order thinking, reasoning, and learning skills needed to master upper-division course work; and programs designed for special subgroups of students (e.g., older returning women, commuters, minorities).

The odds of persistence and graduation are substantially higher for AA transfers who attended the university on a full-time basis as opposed to on a part-time basis. This finding suggests that individuals concerned with the transfer function must devote special attention to the needs of part-time students, who make up a majority of the AA transfer population. Areas in which part-time students may be at a disadvantage include access to transfer-oriented classes that accommodate their work schedules, access to faculty outside of class, and access to and quality of advising. Other areas that may be equally important but less amenable to institutional intervention include access to child care and support by family, friends, and employers (USDOE, 1997).

Partnerships should be established between universities and feeder community colleges to enhance AA transfer success. Rendón and Nora (1988) recommend collaboration in which faculty from both sectors "engage in activities such as comparing, contrasting, and revising course syllabi; comparing student expectations; sharing effective practices; and meshing general education requirements to allow for successful transfer from one segment to the next" (p. 84). In a two-plus-two higher education system like the one that exists in Florida, Rendón and Nora suggest that "faculty work to compare academic standards and expectations; discuss and revise curricula and content in different disciplines, eliminate duplication of course work, mesh two- and four-year college curricula; and exchange student information such as the number of students who transfer and how well students are progressing after they transfer" (p. 85).

One potentially powerful way that faculty from both sectors can collaborate is to develop transfer clubs designed around particular majors (Pincus & DeCamp, 1989). Not only can AA students establish contacts with other students with similar interests, but if faculty (and even students) from the senior institution can participate in occasional meetings, it increases the link for the students who will be transferring. Another action that community college personnel can take is to establish chapters of honor societies at their institutions, particularly ones that are linked to university honor societies. Not only does the existence of such honor societies encourage students to strive for better grades, but it provides them with a point of connection at the university. Occasional joint meetings with the group from the senior institution should be considered. Another idea is to have transfers who have successfully made the transition into the university honor societies work with new transfers in a mentoring capacity. Certainly, similar mentoring programs for transfer students could be established for the general transfer population, as well.

One option for assisting AA transfers might be to establish "bridge" programs between primary feeder community colleges and receiving universities (e.g., Ackermann, 1991). These can be summer programs or programs that run during a transfer student's first year at the University. Such programs provide a venue for introducing transfers to the academic demands of the university. They focus on expectations at the senior institution and the development of specific skills to negotiate the passage into the university. They also introduce AA transfers to the social, political, and cultural context of university life. Bridge programs provide a time for students to be introduced to the university structure and to the academic and personal support services available at an institution (e.g., tutoring and counseling). They also can provide a means to facilitate the development of the critical thinking and study skills needed for the upper-division course work, as well as the personal and social skills needed to handle some of the competing demands AA transfers often encounter after entry into the university. For underrepresented populations, these bridge programs often provide the opportunity to develop the skills needed to function in an environment dominated by other populations. Finally, within the supportive environment of the bridge program, students are able to develop more self-confidence and self-direction, as well as a further commitment to attaining the degree, particularly from the institution conducting the bridge program.

Community college students often report that they perceive the greatest difference between the community college and the university to be the amount of personal attention they receive at the university (Bauer & Bauer, 1994). Bridge programs have the potential to alleviate some of the resulting discomfort by providing transfers with a point of contact at the university. Such programs can focus on some of the expressed major concerns of community college transfers (i.e., speaking during class discussions; giving speeches before groups; development of general self-confidence; meeting new friends; improved critical reading, thinking, and study skills; Bauer & Bauer, 1994, p. 117). Hamby (cited in Beckenstein, 1992) indicated that the strengthening of basic skills, special transfer student advisement, and introduction to skills in research methods might enhance the success rate of community college transfers (p. 56).

One type of bridge program that deserves special consideration in a state like Florida might take the form of courses taught by teams of community college and university personnel and which might extend over two terms (the final term at the feeder community college and the first term at the receiving senior institution). Mostly, course sections could be designed so that students could be with the same faculty over the two terms. However, there will always be a mix of students who transfer from non-primary feeder colleges. If these students had an opportunity to join classes with students who had at least attended the first section of the bridge program at one of the community colleges, they could begin on somewhat common ground. This arrangement might provide a "safer" environment in which transfer students could make new friends and continue to develop the necessary skills to negotiate the passage into upper division course work at the new institution.

Just because there were no statistically significant differences among racial categories once I controlled for other variables does not mean that special attention should not be given to underrepresented populations. The bottom line is that minority students continue to be disproportionately enrolled in community colleges, and too many of them do not persist to obtain the baccalaureate. Individual institutions need to assess how AA transfers from different student racial groups are doing on their campuses. In conducting some follow-up analyses to this study, I saw evidence that some institutions had substantially higher rates of minority AA transfers who experienced academic difficulty or who left the system even though they were in good academic standing. It might be well worth the investment for community colleges and universities to design bridge programs that target minority students while they are enrolled in the community college system, engage these students in co-facilitated activities during their enrollment at the community college, and provide additional support services, particularly during their time of transition into the senior system.

Perhaps the most important action that university personnel can take to enhance AA transfer persistence and graduation is to conduct a serious analysis of those barriers on a particular campus or in a particular system that these students face. Educators need to determine which faculty attitudes, institutional policies, and campus practices do not facilitate AA transfer student success. Then, they need to take whatever steps they can to make the necessary changes and improvements. As Tinto (1987) has pointed out, the key ingredient to retention is a commitment on the part of university personnel to the growth and development of all members of the educational community.

Conclusions

For decades, scholars have been trying to understand and interpret patterns of college student persistence/attrition and performance. Their concern has stemmed in part from a desire to improve theories that explain student behavior and in part for practical reasons, because student attrition is usually costly to the institution and to the student alike. However, to date, most educational attainment research has focused on explanations for traditional native students at individual institutions.

Because public community colleges provide a low-cost, flexible means for students to begin working toward baccalaureate degrees, transfers comprise an increasingly larger proportion of university student bodies. Among these transfers are those students who attain the Associate in Arts degree prior to transfer. Frequently, though, transfer students show a higher rate of attrition from college than their traditional native peers. There is a need for additional research regarding the educational attainment patterns of community college transfers, and more specifically of AA transfers.

In a state like Florida, the educational attainment of AA transfers is of particular interest because the higher education system is structured with the expectation that many students will begin their baccalaureate education in the public Community College System. More than half of the upper-division students enrolled in the State University System are community college transfers, with a large percentage being AA transfers.

This investigation has resulted in the development of three logistic regression models to predict whether AA transfers persist or do not persist, attain good academic standing or not, and graduate within the specified time or not. Additionally, a discriminant analysis model has been designed to predict whether, after a specified time, AA transfers will graduate, still be enrolled, leave the System in good academic standing, or leave the System not in good academic standing.

The study has implications for theory, research, and practice. From a theoretical perspective, the results indicate that undergraduate educational attainment for AA transfers is a complex, longitudinal process. Transfer students who have earned the associate degree already have demonstrated the ability to make the transition from high school to postsecondary education and to become sufficiently integrated into the community college to persist to initial degree attainment. However, transfer students face another transition when they enter a senior institution. Among the variables associated with the educational attainment outcomes for AA transfers are the student's individual attributes (specifically, gender and age) and pre-university schooling experiences (community college grade point average and time gap between prior postsecondary and university enrollment). As the student makes the transition into the university, the selectivity of the institution and the student's first-term course load provide special challenges that influence attainment. Outcomes are further associated with how well the student adapts to the demands of this new setting (first-term change in grade point average), and how well the student becomes integrated into the new academic environment (requested degree changes and institutional change).

From a research perspective, this study incorporates an improved methodology that clearly delineates among students in four mutually exclusive outcome groups. The longitudinal design, which incorporates data for more than 12,000 students from nine institutions, enhances one's ability to use the research findings in other institutional settings. The final models provide classification schemes that correctly predict 69% to 86% of the outcomes. The prediction results indicate that the final models are least effective in predicting who will remain enrolled at the end of the specified time and who will leave in good academic standing. Further study is needed to understand the characteristics and experiences of those students for whom the models do not accurately estimate outcomes. Also, more sophisticated models should be tested, including models that capture some of the personal, psychological, and environmental factors that influence transfer students' progression, retention, and achievement. Other models should be designed and tested that capture nonlinearity between the outcome variables and the predictor variables. Finally, models should be developed that capture effects for subpopulations of AA transfers, particularly students at universities with particular characteristics coming from feeder community colleges with particular characteristics (perhaps through the use of hierarchical models).

From a practical perspective, this study offers educators a starting point for investigating the educational attainment patterns of AA transfers at their respective institutions or within their respective systems of higher education. Researchers and practitioners need to continue to seek information regarding the factors that influence AA transfer academic performance, persistence, and baccalaureate degree attainment in particular universities. They also need to evaluate intervention strategies to determine which ones most effectively improve degree attainment for this population. Without such knowledge, university personnel may fail to respond appropriately to the distinctive needs of transfer students. The insights gained from this investigation and subsequent research can aid university personnel in revising and improving campus policies and practices and in designing educational support services suitable for this increasingly important segment of the university population.

APPENDIX A

Approval of Human Subjects Committee

APPENDIX B

Supplemental Tables

Table 15.
Correlation Matrix for Entire Sample

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	1																
2	-0.01	1															
3	0.05	-0.47	1														
4	-0.01	-0.69	-0.08	1													
5	-0.08	-0.05	-0.01	0.05	1												
6	0.14	0.01	-0.09	0.02	-0.16	1											
7	0.03	-0.01	0.04	0.00	-0.26	-0.04	1										
8	-0.05	-0.03	-0.07	0.08	0.12	0.02	-0.06	1									
9	-0.09	0.21	-0.10	-0.19	0.17	0.03	-0.11	0.49	1								
10	0.01	0.02	-0.01	-0.01	0.03	0.05	-0.03	0.01	0.05	1							
11	-0.04	0.08	-0.01	-0.11	0.25	0.04	-0.16	0.11	0.23	0.18	1						
12	0.03	-0.01	0.08	-0.02	-0.03	0.07	-0.03	0.04	0.09	0.09	0.26	1					
13	0.06	0.08	-0.03	-0.04	-0.15	-0.13	0.09	-0.07	-0.10	-0.03	0.01	0.02	1				
14	-0.02	-0.01	0.00	-0.01	0.04	-0.02	-0.03	0.07	-0.11	-0.05	-0.06	-0.02	-0.03	1			
15	-0.02	0.00	0.01	0.00	0.07	-0.03	-0.02	0.02	0.08	-0.02	0.04	-0.11	-0.09	-0.02	1		
16	-0.01	-0.02	0.09	-0.02	-0.11	0.05	-0.02	0.06	0.11	0.12	0.22	0.41	0.02	-0.01	-0.08	1	
17	-0.05	-0.07	0.02	0.06	0.02	0.06	-0.06	-0.01	-0.04	0.00	-0.04	0.01	0.08	0.29	0.07	0.01	1

1 FEMALE
2 WHITE
3 BLACK
4 HISPANIC

5 BRTHYEAR
6 COLLGPA
7 TIMEGAP
8 LARGE

9 SELECTIV
10 FALLENTR
11 COURSLD1
12 FINAID1

13 GPACHANG
14 DEGCHNGS
15 INSTCHNG
16 FINAIDAD
17 TOTTERMS

Table 16.
Summary of Variable Characteristics for Calibration Sample

Variables	Mean	*SD*	Skewness	Kurtosis	Missing
Dependent Variables					
Persist	.76	.43	-1.23	-.48	0.02%
Cumulative GPA >2.0	.89	.32	-2.45	4.02	1.44%
Graduate	.65	.48	-.63	-1.61	0.00%
Predictor Variables					
Gender (Female = 1)	.57	.50	-.28	-1.92	0.00%
Ethnicity					
(White = 1)	.80	.40	-1.52	.32	0.11%
(Black = 1)	.05	.22	4.01	14.06	0.11%
(Hispanic = 1)	.10	.30	2.62	4.86	0.11%
Birth Year	1966.79	6.13	-2.29	6.17	0.02%
Community College GPA	2.95	.49	.07	-.71	1.77%
Enrollment Time Gap	5.70	15.68	8.11	87.01	0.44%
Institutional Size (15,000+ = 1)	.82	.39	-1.63	.65	0.00%
Institutional Selectivity	1029.85	39.61	-.39	.29	0.00%
Cohort Group (Fall = 1)	.70	.46	-.87	-1.25	0.00%
First-Term Load (Hours)	11.03	3.62	-.73	-.01	0.00%
First-Term Financial Aid	361.21	582.30	1.80	4.15	0.00%
Transfer Shock	-.27	.84	-.62	1.03	5.38%
Degree Changes	.56	.77	1.35	1.73	0.00%
Institution Changes	.04	.20	4.53	18.48	0.00%
Additional Financial Aid	400.02	865.63	2.22	4.32	0.00%
Cumulative GPA	2.83	.77	-1.09	1.65	1.44%
Total Number of Terms	5.85	2.43	-.08	-.20	0.00%
Valid *n* (Listwise)				(*n* = 6,370)	5.75%

Table 17.
Summary of Variable Characteristics for Cross Validation Sample

Variables	Mean	*SD*	Skewness	Kurtosis	Missing
Dependent Variables					
Persist	.76	.43	-1.19	-.58	0.02%
Cumulative GPA >2.0	.89	.32	-2.45	4.01	1.63%
Graduate	.65	.48	-.61	-1.63	0.00%
Predictor Variables					
Gender (Female = 1)	.56	.50	-.25	-1.94	0.00%
Ethnicity					
(White = 1)	.79	.41	-1.43	.05	0.05%
(Black = 1)	.06	.23	3.90	13.19	0.05%
(Hispanic = 1)	.11	.32	2.44	3.96	0.05%
Birth Year	1966.68	6.22	-2.20	5.33	0.05%
Community College GPA	2.94	.48	.10	-.67	1.77%
Enrollment Time Gap	5.83	16.77	8.19	86.07	0.37%
Institutional Size	.82	.38	-1.68	.84	0.00%
(15,000+ = 1)					
Institutional Selectivity	1030.47	40.12	-.45	.36	0.00%
Cohort Group (Fall = 1)	.71	.45	-.92	-1.15	0.00%
First-Term Load (Hours)	10.99	3.69	-.74	-.15	0.00%
First-Term Financial Aid	356.36	575.50	1.74	3.46	0.00%
Transfer Shock	-.26	.84	-.60	.98	5.83%
Degree Changes	.56	.77	1.33	1.38	0.00%
Institution Changes	.05	.21	4.37	17.09	0.00%
Additional Financial Aid	405.00	878.15	2.27	4.86	0.00%
Cumulative GPA	2.82	.77	-1.12	1.79	1.63%
Total Number of Terms	5.89	2.45	-.08	-.25	0.02%
Valid *n* (Listwise)				(*n* = 6,454)	6.15%

Table 18.
Summary of Variable Means By Group (With Standard Deviations)

Variables	Persist	Not Persist	Good Standing	Not Good Standing	Graduate	Not Graduate
Persist	1.00	0.00	.85	.15	1.00	.32
	(.00)	(.00)	(.36)	(.35)	(.00)	(.47)
Good Standing	.98	.58	1.00	.00	1.00	.67
	(.15)	(.49)	(.00)	(.00)	(.03)	(.47)
Graduate	.85	.00	.74	.005	1.00	.00
	(.35)	(.00)	(.44)	(.07)	(.00)	(.00)
Female	.57	.56	.58	.44	.58	.54
	(.50)	(.50)	(.49)	(.50)	(.49)	(.50)
White	.80	.78	.80	.74	.82	.76
	(.40)	(.42)	(.40)	(.44)	(.39)	(.43)
Black	.05	.06	.05	.09	.05	.07
	(.22)	(.24)	(.22)	(.29)	(.21)	(.25)
Hispanic	.10	.12	.11	.12	.09	.13
	(.30)	(.33)	(.31)	(.33)	(.29)	(.34)
Birth Year	1967.01	1965.87	1966.66	1967.63	1967.23	1965.83
	(6.04)	(6.51)	(6.31)	(4.64)	(5.89)	(6.57)
College GPA	2.98	2.85	2.98	2.64	2.99	2.87
	(.48)	(.49)	(.48)	(.40)	(.48)	(.48)
Time Gap	4.94	8.35	5.72	5.18	4.56	7.98
	(14.26)	(21.12)	(16.27)	(13.33)	(13.52)	(20.13)
Large University	.83	.78	.82	.82	.84	.78
	(.38)	(.41)	(.38)	(.38)	(.37)	(.41)
Selectivity	1032.09	1024.08	1030.56	1028.37	1034.12	1022.90
	(39.96)	(38.94)	(40.01)	(38.97)	(39.92)	(38.73)
Fall Entrant	.71	.67	.71	.67	.73	.65
	(.45)	(.47)	(.45)	(.47)	(.44)	(.48)
First-Term Load	11.46	9.61	11.14	10.40	11.92	9.35
	(3.40)	(4.06)	(3.61)	(3.59)	(3.05)	(4.06)
First-Term Aid	381.66	286.95	370.71	294.13	409.22	266.20
	(590.91)	(533.09)	(584.03)	(554.09)	(605.02)	(514.91)
Transfer Shock	-.16	-.60	-.15	-1.18	-.12	-.55
	(.76)	(.99)	(.75)	(.94)	(.71)	(.98)
Degree Changes	.64	.32	.59	.36	.61	.47
	(.80)	(.59)	(.78)	(.66)	(.79)	(.72)
Institution Change	.05	.03	.04	.05	.03	.07
	(.21)	(.18)	(.20)	(.23)	(.18)	(.25)
Additional Aid	430.84	313.64	415.18	337.79	461.74	293.88
	(896.60)	(782.99)	(883.69)	(799.76)	(923.92)	(755.55)
Valid *n* (Listwise)	*n* = 9347	*n* = 2714	*n* = 10765	*n* = 1296	*n* = 8061	*n* = 4000

Table 19.
Logistic Regression Results: Full Models for Calibration Sample

	Persist vs. Not Persist ($n = 6{,}006$)		GPA>2.0 vs. GPA<2.0 ($n = 6{,}004$)		Graduate vs. Not Graduate ($n = 6{,}006$)	
Predictor	*B*	*S.E.*	*B*	*S.E.*	*B*	*S.E.*
Gender (Female-Male)	.090	.071	.423	.105***	.159	.065*
Ethnicity	--	--	–	–[a]	--	--
(White-Other)	.116	.171	.441	.227[a]	.195	.154
(Black-Other)	.273	.224	.400	.295	-.017	.202
(Hispanic-Other)	.365	.200[a]	.758	.278**	.285	.179
(White-Black)	-.157	.155	.041	.207	.212	.141
(White-Hispanic)	-.249	.122*	-.317	.188[a]	-.090	.109
(Black-Hispanic)	-.092	.186	-.358	.262	-.302	.168[a]
Birth Year	.033	.006***	.011	.012	.036	.006***
College GPA	.876	.077***	2.303	.132***	.834	.070***
Time Gap	-.009	.002***	.003	.005	-.008	.002***
Size (Large - Other)	-.003	.100	-.065	.160	-.019	.093
Selectivity	.005	.001***	.004	.002*	.007	.001***
Cohort (Fall-Spring)	.200	.075**	.322	.111**	.189	.069**
1st-Term Load	.120	.011***	-.007	.018	.205	.010***
1st-Term Aid	< .001	<.001	< .001	<.001	< .001	<.001
1st-Term Δ GPA	.871	.043***	1.710	.065***	.929	.042***
Degree Changes	.818	.056***	.708	.080***	.393	.043***
Institution Δ (Yes-No)	.679	.194***	.592	.251*	-.872	.148***
Additional Aid	< .001	<.001	-<.001	<.001	< .001	<.001
Constant	-73.30	11.842***	-29.10	22.993	-81.83	11.200***
* $p < .05$ ** $p < .01$ *** $p < .001$ [a] $p < .10$	Model χ^2 =1084.253 $df = 16, p < .001$ Hosmer-Lemeshow Goodness of Fit: $\chi^2 = 15.5316$ $df = 8, p = .0495$		Model χ^2 =1450.318 $df = 16, p < .001$ Hosmer-Lemeshow Goodness of Fit: $\chi^2 = 5.6104$ $df = 8, p = .6907$		Model χ^2 = 1511.988 $df = 16, p < .001$ Hosmer-Lemeshow Goodness of Fit: $\chi^2 = 8.0536$ $df = 8, p = .4282$	

Table 19. (Continued)
Logistic Regression Results: Full Models for Calibration Sample

	Persist vs. Not Persist (n = 6,006)		GPA>2.0 vs. GPA<2.0 (n = 6,004)		Graduate vs. Not (n = 6,006)	
	Odds Ratio		Odds Ratio		Odds Ratio	
Predictor	Point Estimate	95% Interval	Point Estimate	95% Interval	Point Estimate	95% Interval
Gender (Female-Male)	1.094	0.95, 1.26	1.526	1.24, 1.87	1.173	1.03, 1.33
Ethnicity	--		--		--	
(White-Other)	1.123	0.80, 1.57	1.555	1.00, 2.42	1.215	0.90, 1.64
(Black-Other)	1.314	0.85, 2.04	1.492	0.84, 2.66	0.983	0.66, 1.46
(Hispanic-Other)	1.440	0.97, 2.13	2.135	1.24, 3.68	1.330	0.94, 1.89
(White-Black)	0.855	0.63, 1.16	1.042	0.70, 1.56	1.236	0.94, 1.63
(White-Hispanic)	0.780	0.61, 0.99	0.728	0.50, 1.05	0.914	0.74, 1.13
(Black-Hispanic)	0.912	0.63, 1.31	0.699	0.42, 1.17	0.740	0.53, 1.03
Birth Year (5 years)[b]	1.181	1.11, 1.25	1.055	0.94, 1.18	1.197	1.13, 1.27
College GPA (0.25)[b]	1.245	1.20, 1.29	1.778	1.67, 1.90	1.232	1.19, 1.27
Time Gap (12 months)[b]	0.901	0.86, 0.95	1.034	0.92, 1.16	0.914	0.87, 0.96
Size (Large - Other)	0.997	0.82, 1.21	0.937	0.68, 1.28	0.982	0.82, 1.18
Selectivity (50 points)[b]	1.271	1.14, 1.42	1.197	1.02, 1.40	1.391	1.26, 1.53
Cohort (Fall-Spring)	1.221	1.05, 1.41	1.379	1.11, 1.71	1.209	1.06, 1.38
1st-Term Load (3 credit hours)[b]	1.434	1.35, 1.53	0.980	0.88, 1.09	1.847	1.74, 1.96
1st-Term Aid ($500)[b]	1.003	0.94, 1.07	1.001	0.92, 1.09	1.023	0.96, 1.09
1st-Term Δ GPA (0.25)[b]	1.243	1.22, 1.27	1.534	1.49, 1.58	1.262	1.24, 1.29
Degree Changes	2.266	2.03, 2.53	2.030	1.74, 2.37	1.481	1.36, 1.61
Institution Δ (Yes-No)	1.972	1.35, 2.88	1.807	1.11, 2.95	0.418	0.31, 0.56
Additional Aid ($1000)[b]	1.041	0.94, 1.15	0.992	0.86, 1.14	1.016	0.94, 1.10

[b] Odds ratios calculated for the identified increase for these variables.

Table 20.
Logistic Regression Results: Reduced Models for Calibration Sample

	Persist vs. Not Persist (n = 6,006)		GPA > 2.0 vs. GPA < 2.0 (n = 6,004)		Graduate vs. Not Graduate (n = 6,006)	
Predictor	*B*	*S.E.*	*B*	*S.E.*	*B*	*S.E.*
Gender (Female-Male)	--	--	.430	.104***	.155	.065*
Ethnicity	--	--[a]	--	--[a]	--	--
(White-Other)	.129	.171	.443	.225*	--	--
(Black-Other)	.317	.222	.396	.291	--	--
(Hispanic-Other)	.377	.198[a]	.754	.275**	--	--
(White-Black)	-.187	.154	.047	.203	--	--
(White-Hispanic)	-.248	.132[a]	-.312	.181[a]	--	--
(Black-Hispanic)	-.060	.192	-.358	.258	--	--
Birth Year	.032	.006***	--	--	.035	.006***
College GPA	.892	.076***	2.279	.130***	.842	.070***
Time Gap	-.009	.002***	--	--	-.008	.002***
Selectivity	.005	.001***	.003	.001*	.007	.001***
Cohort (Fall-Spring)	.206	.075**	.312	.109**	.197	.068**
First-Term Load	.122	.010***	--	--	.206	.010***
First-Term Δ GPA	.873	.043***	1.704	.064***	.932	.042***
Degree Changes	.818	.056***	.706	.079***	.392	.043***
Institution Δ (Yes-No)	.658	.192***	.597	.247*	-.888	.147***
Constant	-70.81	11.59***	-7.83	1.404***	-80.261	10.906***
* $p < .05$ ** $p < .01$ *** $p < .001$ [a] $p < .10$	Model χ^2 = 1081.656 df = 12, $p < .001$ Hosmer-Lemeshow Goodness of Fit: χ^2 = 12.3822 df = 8, $p < .135$		Model χ^2 = 1448.961 df = 10, $p < .001$ Hosmer-Lemeshow Goodness of Fit: χ^2 = 4.4013 df = 8, $p < .8193$		Model χ^2 = 1506.334 df = 10, $p < .001$ Hosmer-Lemeshow Goodness of Fit: χ^2 = 11.8119 df = 8, $p < .1599$	

Table 20. (Continued)
Logistic Regression Results: Reduced Models for Calibration Sample

	Persist vs. Not Persist (n = 6,006)		GPA≥2.0 vs. GPA<2.0 (n = 6,004)		Graduate vs. Not (n = 6,006)	
	Odds Ratio		Odds Ratio		Odds Ratio	
Predictor	Point Estimate	95% Interval	Point Estimate	95% Interval	Point Estimate	95% Interval
Gender (Female-Male)	--	--	1.537	1.25, 1.89	1.167	1.03, 1.33
Ethnicity	--	--	--	--	--	--
(White-Other)	1.138	0.81, 1.59	1.557	1.00, 2.42	--	--
(Black-Other)	1.373	0.89, 2.12	1.486	0.84, 2.63	--	--
(Hispanic-Other)	1.458	0.99, 2.15	2.126	1.24, 3.64	--	--
(White-Black)	0.829	0.61, 1.22	1.048	0.70, 1.56	--	--
(White-Hispanic)	0.781	0.60, 1.01	0.732	0.51, 1.04	--	--
(Black-Hispanic)	0.941	0.65, 1.37	0.699	0.42, 1.16	--	--
Birth Year (5 years)[b]	1.174	1.11, 1.24	--	--	1.193	1.13, 1.26
College GPA (0.25)[b]	1.250	1.20, 1.30	1.768	1.66, 1.88	1.234	1.19, 1.28
Time Gap (12 months)[b]	0.901	0.86, 0.95	--	--	0.913	0.87, 0.96
Selectivity (50 points)[b]	1.271	1.16, 1.39	1.179	1.04, 1.34	1.391	1.29, 1.50
Cohort (Fall-Spring)	1.229	1.06, 1.42	1.366	1.10, 1.69	1.218	1.07, 1.39
First-Term Load (3 hours)[b]	1.443	1.36, 1.53	--	--	1.853	1.75, 1.96
First-Term Δ GPA (0.25)[b]	1.244	1.22, 1.27	1.531	1.48, 1.58	1.262	1.24, 1.29
Degree Changes	2.265	2.03, 2.53	2.025	1.73, 2.36	1.480	1.36, 1.61
Institution Δ (Yes-No)	1.930	1.32, 2.81	1.817	1.12, 2.95	0.412	0.31, 0.55

[b] Odds ratios calculated for the identified increase for these variables.

Table 21.
Logistic Regression Results: Reduced Models for Entire Sample

	Persist vs. Not Persist (N = 12,069)		GPA>2.0 vs. GPA<2.0 (N = 12,069)		Graduate vs. Not Graduate (N = 12,078)	
Predictor	*B*	*S.E.*	*B*	*S.E.*	*B*	*S.E.*
Gender (Female-Male)	--	--	.386	.073***	.145	.045**
Ethnicity	--	--^{a}	--	--^{a}	--	--
(White-Other)	-.038	.124	.259	.166	--	--
(Black-Other)	.213	.158	.128	.208	--	--
(Hispanic-Other)	.101	.141	.453	.196*	--	--
(White-Black)	-.251	.111*	.132	.146	--	--
(White-Hispanic)	-.139	.090	-.193	.130	--	--
(Black-Hispanic)	.112	.137	-.325	.184	--	--
Birth Year	.027	.004***	--	--	.030	.004***
College GPA	.881	.053***	2.430	.094***	.867	.049***
Time Gap	-.006	.001***	--	--	-.007	.001***
Selectivity	.005	.001***	.004	.001***	.006	.001***
Cohort (Fall-Spring)	.103	.053^{a}	.198	.077*	.181	.048***
First-Term Load	.119	.007***	--	--	.195	.007***
First-Term Δ GPA	.805	.030***	1.636	.044***	.876	.029***
Degree Changes	.765	.038***	.613	.054***	.375	.030***
Institution Change	.727	.134***	.550	.166***	-.775	.102***
Constant	-60.649	8.131***	-8.466	0.967***	-69.595	7.614***
* $p < .05$ ** $p < .01$ *** $p < .001$ ^{a} $p < .10$	Model χ^2 = 1963.325 df = 12, $p < .001$ Hosmer-Lemeshow Goodness of Fit: χ^2 = 43.2961 df = 8, $p < .001$		Model χ^2 = 2815.633 df = 10, $p < .001$ Hosmer-Lemeshow Goodness of Fit: χ^2 = 3.4913 df = 8, $p < .900$		Model χ^2 = 2808.355 df = 10, $p < .001$ Hosmer-Lemeshow Goodness of Fit: χ^2 = 21.5279 df = 8, $p < .006$	

Table 21. (Continued)
Logistic Regression Results: Reduced Models for Entire Sample

	Persist vs. Not Persist (N = 12,069)		GPA>2.0 vs. GPA<2.0 (N = 12,069)		Graduate vs. Not (N = 12,078)	
	Odds Ratio		Odds Ratio		Odds Ratio	
Predictor	Point Estimate	95% Interval	Point Estimate	95% Interval	Point Estimate	95% Interval
Gender (Female-Male)	--	--	1.471	1.28, 1.70	1.157	1.06, 1.26
Ethnicity	--	--	--	--	--	--
(White-Other)	0.963	0.76, 1.23	1.296	0.94, 1.79	--	--
(Black-Other)	1.238	0.91, 1.69	1.136	0.76, 1.71	--	--
(Hispanic-Other)	1.106	0.84, 1.46	1.572	1.07, 2.31	--	--
(White-Black)	0.778	0.63, 0.97	1.141	0.86, 1.52	--	--
(White-Hispanic)	0.871	0.72, 1.05	0.824	0.64, 1.06	--	--
(Black-Hispanic)	1.119	0.86, 1.46	0.723	0.50, 1.04	--	--
Birth Year (5 years)[b]	1.145	1.10, 1.19	--	--	1.163	1.12, 1.21
College GPA (0.25)[b]	1.247	1.21, 1.28	1.836	1.75, 1.92	1.242	1.21, 1.27
Time Gap (12 months)[b]	0.927	0.90, 0.96	--	--	0.925	0.90, 0.96
Selectivity (50 points)[b]	1.259	1.19, 1.33	1.209	1.11, 1.32	1.343	1.27, 1.42
Cohort (Fall-Spring)	1.108	1.00, 1.23	1.219	1.05, 1.42	1.198	1.09, 1.32
First-Term Load (3 credit hours)[b]	1.427	1.37, 1.49	--	--	1.797	1.73, 1.87
First-Term Δ GPA (0.25)[b]	1.223	1.21, 1.24	1.505	1.47, 1.54	1.245	1.23, 1.26
Degree Changes	2.150	1.99, 2.32	1.846	1.66, 2.05	1.454	1.37, 1.54
Institution Change (Yes-No)	2.068	1.59, 2.69	1.733	1.25, 2.40	0.461	0.38, 0.56

[b] Odds ratios calculated for the identified increase for these variables.

Table 22.
Summary for Cases Not Fit Well By Final Logistic Regression Models

			Good Standing		Graduate	
	Good Fit Mean (*SD*)	Not Good Fit Mean (*SD*)	Good Fit Mean (*SD*)	Not Good Fit Mean (*SD*)	Good Fit Mean (*SD*)	Not Good Fit Mean (*SD*)
Female	.57	.53	.57	.48	.57	.69
	(.50)	(.51)	(.50)	(.50)	(.50)	(.48)
White	.80	.88	.80	.71*	.80	.62
	(.40)	(.33)	(.40)	(.46)	(.40)	(.51)
Black	.05	.06	.05	.06	.05	.00
	(.22)	(.24)	(.22)	(.25)	(.23)	(.00)
Hispanic	.11	.06	.11	.18*	.11	.38***
	(.31)	(.24)	(.31)	(.39)	(.31)	(.51)
Birth Year	1966.81	1968.21	1966.81	1967.27	1966.81	1967.69
	(6.16)	(4.48)	(6.16)	(5.31)	(6.16)	(4.44)
College GPA	2.95	3.16**	2.95	2.95	2.95	3.23*
	(.49)	(.51)	(.49)	(.41)	(.49)	(.51)
Time Gap	5.60	2.76	5.60	4.55	5.59	3.62
	(15.90)	(2.98)	(15.94)	(8.01)	(15.88)	(4.21)
Large University	.82	.94	.82	.85	.82	.85
	(.39)	(.24)	(.39)	(.35)	(.39)	(.38)
Selectivity	1030.57	1041.02	1030.62	1027.38	1030.59	1043.85
	(40.09)	(32.72)	(40.10)	(34.05)	(40.06)	(40.44)
Fall Entrant	.70	.65	.70	.66	.70	.62
	(.46)	(.49)	(.46)	(.47)	(.46)	(.51)
First-Term Load	11.15	13.00**	11.16	10.23**	11.15	12.62
	(3.55)	(2.47)	(3.55)	(4.02)	(3.55)	(6.13)
First-Term Aid	366.88	454.00	367.74	321.54	367.17	327.31
	(584.69)	(527.49)	(584.46)	(597.29)	(584.57)	(490.75)
Transfer Shock	-.26	.22***	-.27	-.05**	-.26	-.66
	(.83)	(.62)	(.83)	(.67)	(.83)	(1.47)
Degree Changes	.56	1.82***	.56	1.03***	.57	.77
	(.77)	(.72)	(.77)	(1.04)	(.77)	(.73)
Institution Change	.04	.15**	.04	.09**	.04	.00
	(.20)	(.36)	(.20)	(.29)	(.20)	(.00)
Additional Aid	412.06	768.41*	413.74	361.78	413.10	352.85
	(880.38)	(1229.00)	(882.62)	(783.86)	(881.81)	(618.20)
Valid N (Listwise)	12035	34	11959	110	12065	13

Statistically significant differences between means for cases fit well by the model and cases not fit well by the model: * $p < .05$; ** $p < .01$; *** $p < .001$

Table 23.
Summary of Variable Characteristics for Calibration Sample Used for Discriminant Analysis

		Persisters	Nonpersisters	Nonpersisters	
	Graduates	Still Enrolled	GPA>2.0	GPA<2.0	Total
	Mean	Mean	Mean	Mean	Mean
Variables	(*SD*)	(*SD*)	(*SD*)	(*SD*)	(*SD*)
Gender (Female = 1)	.58	.54	.63	.43	.57
	(.49)	(.50)	(.48)	(.50)	(.49)
Ethnicity					
(White = 1)	.82	.73	.79	.78	.80
	(.38)	(.45)	(.41)	(.41)	(.40)
(Black = 1)	.04	.08	.05	.08	.05
	(.20)	(.28)	(.22)	(.27)	(.22)
(Hispanic = 1)	.09	.14	.11	.10	.10
	(.29)	(.35)	(.32)	(.30)	(.30)
Birth Year	1967.33	1965.98	1964.53	1967.75	1966.86
	(5.75)	(6.70)	(7.73)	(4.57)	(6.14)
Community College GPA	2.99	2.92	3.00	2.64	2.95
	(.49)	(.48)	(.50)	(.40)	(.49)
Enrollment Time Gap	4.32	6.44	10.77	5.30	5.47
	(12.50)	(14.94)	(25.80)	(11.01)	(15.17)
Institutional Selectivity	1034.13	1018.90	1018.98	1031.17	1030.24
	(39.92)	(37.00)	(38.26)	(38.52)	(39.77)
Cohort Group (Fall = 1)	.73	.63	.66	.63	.70
	(.45)	(.48)	(.47)	(.48)	(.46)
First-Term Load	12.00	8.95	9.19	10.66	11.18
	(2.96)	(3.86)	(4.14)	(3.45)	(3.51)
First-Term GPA Change	-.12	-.43	-.19	-1.25	-.27
	(.71)	(.93)	(.77)	(.92)	(.84)
Degree Changes	.61	.82	.36	.29	.57
	(.79)	(.87)	(.62)	(.56)	(.77)
Institution Change (Yes = 1)	.03	.13	.03	.03	.04
	(.17)	(.34)	(.16)	(.18)	(.20)
Total Number of Terms	6.40	8.20	3.60	3.05	5.92
	(1.69)	(2.29)	(2.17)	(1.88)	(2.37)
Valid *N* (Listwise)	4012	657	771	1110	6004

Table 24.
Educational Attainment Outcome Group Contrasts for Calibration

Contrast	Estimate	95%	Contrast	Estimate	95%
Gender (Female = 1)			Hispanic		
1 vs. 2[b]	.04	-.01, .10	1 vs. 2[b]	-.05***	-.09, -.02
1 vs. 3[b]	-.05	-.09, .05	1 vs. 3[b]	-.02	-.05, .009
1 vs. 4	.15***	.09, .21	1 vs. 4[b]	-.005	-.04, .03
2 vs. 3[b]	-.09**	-.15, -.02	2 vs. 3[b]	.03	-.01, .07
2 vs. 4	.11***	.03, .18	2 vs. 4[b]	.05*	.003, .09
3 vs. 4	.19***	.12, .26	3 vs. 4[b]	.02	-.03, .06
White			Birth Year		
1 vs. 2[b]	.10***	.05, .14	1 vs. 2[a]	1.34***	.69, 2.00
1 vs. 3[b]	.03	-.01, .07	1 vs. 3[a]	2.79***	2.18, 3.40
1 vs. 4[b]	.04	-.004, .09	1 vs. 4	-.42	-1.12, .28
2 vs. 3[b]	-.06*	-.12, -.008	2 vs. 3[a]	1.45***	.62, 2.27
2 vs. 4[b]	-.05	-.11, .004	2 vs. 4[a]	-1.76***	-2.66, -.87
3 vs. 4[b]	.008	-.05, .06	3 vs. 4[a]	-3.21***	-4.08, -2.35
Black			Community College Grade Point Average		
1 vs. 2[b]	-.04***	-.06, -.02	1 vs. 2	.07**	.02, .12
1 vs. 3[b]	-.01	-.03, .01	1 vs. 3[b]	-.008	-.06, .04
1 vs. 4[b]	-.03**	-.06, -.007	1 vs. 4[a]	.35***	.29, .40
2 vs. 3[b]	.03*	.0002, .06	2 vs. 3	-.08**	-.15, -.01
2 vs. 4[b]	.007	-.03, .04	2 vs. 4[a]	.27***	.20, .34
3 vs. 4[b]	-.02	-.05, .009	3 vs. 4[a]	.35***	.29, .42

1: Graduate
2: Still enrolled student
3: Nonpersister who left in good academic standing
4: Nonpersister who left not in good academic standing

* $p < .05$ ** $p < .01$ *** $p < .001$[c]

[a] Determined to be of practical importance for the population with a threshold set equal to $(0.10)(S_Y/S_X)$ for continuous variables and $(0.33)(S_Y)$ for dichotomous variables.

[b] Determined to be of no practical importance for the population.

[c] Alpha was set at .001 because of concerns with violations of assumptions.

Table 24. (Continued)
Educational Attainment Outcome Group Contrasts for Calibration

Contrast	Estimate	95%	Contrast	Estimate	95%
Time Gap			First-Term Course Load		
1 vs. 2[a]	-2.13**	-3.75, -.50	1 vs. 2[a]	3.05***	2.70, 3.41
1 vs. 3[a]	-6.45***	-7.97, -4.93	1 vs. 3[a]	2.81***	2.48, 3.14
1 vs. 4	-.99	-2.72, .75	1 vs. 4[a]	1.34***	.96, 1.71
2 vs. 3[a]	-4.32***	-6.37, -2.27	2 vs. 3	-.24	-.69, .21
2 vs. 4	1.14	-1.07, 3.36	2 vs. 4[a]	-1.72***	-2.20, -1.23
3 vs. 4[a]	5.46***	3.32, 7.60	3 vs. 4[a]	-1.48***	-1.95, -1.01
Selectivity			First-Term Change in Grade Point Average		
1 vs. 2[a]	15.24***	10.99, 19.48	1 vs. 2[a]	.32***	.23, .40
1 vs. 3[a]	15.15***	11.18, 19.12	1 vs. 3	.08*	.03, .16
1 vs. 4	2.96	-1.58, 7.50	1 vs. 4[a]	1.14***	1.05, 1.23
2 vs. 3	-.09	-5.45, 5.27	2 vs. 3[a]	-.24***	-.34, -.14
2 vs. 4[a]	-12.28***	-18.07, -	2 vs. 4[a]	.82***	.71, .93
3 vs. 4[a]	-12.19***	-17.78, -	3 vs. 4[a]	1.06***	.95, 1.17
Cohort Group (Fall = 1)			Number of Requested Degree Changes		
1 vs. 2[b]	.10***	.05, .15	1 vs. 2[a]	-.21***	-.29, -.12
1 vs. 3[b]	.07***	.02, .12	1 vs. 3[a]	.25***	.18, .33
1 vs. 4[b]	.09***	.04, .15	1 vs. 4[a]	.32***	.23, .40
2 vs. 3[b]	-.03	-.09, .03	2 vs. 3[a]	.46***	.35, .56
2 vs. 4[b]	-.03	-.07, .06	2 vs. 4[a]	.52***	.41, .63
3 vs. 4[b]	.02	-.04, .09	3 vs. 4	.06	-.04, .17

1: Graduate
2: Still enrolled student
3: Nonpersister who left in good academic standing
4: Nonpersister who left not in good academic standing

* $p < .05$ ** $p < .01$ *** $p < .001$[c]

[a] Determined to be of practical importance for the population with a threshold set equal to $(0.10)(S_y/S_x)$ for continuous variables and $(0.33)(S_y)$ for dichotomous variables.

[b] Determined to be of no practical importance for the population.

[c] Alpha was set at .001 because of concerns with violations of assumptions.

Table 24. (Continued)
Educational Attainment Outcome Group Contrasts for Calibration

Contrast	Estimate	95%	Contrast	Estimate	95%
Institution Change			Total Number of Terms Attended		
1 vs. 2	-.10***	-.12, -.08	1 vs. 2[a]	-1.80***	-2.00, -1.60
1 vs. 3	.03	-.02, .02	1 vs. 3[a]	2.80***	2.61, 2.99
1 vs. 4	-.02	-.02, .02	1 vs. 4[a]	3.35***	3.14, 3.57
2 vs. 3[a]	.10***	.08, .13	2 vs. 3[a]	4.60***	4.35, 4.86
2 vs. 4[a]	.10***	.07, .13	2 vs. 4[a]	5.16***	4.88, 5.43
3 vs. 4	-.005	-.03, .02	3 vs. 4[a]	.55***	.29, .81

1: Graduate
2: Still enrolled student
3: Nonpersister who left in good academic standing
4: Nonpersister who left not in good academic standing

* $p < .05$ ** $p < .01$ *** $p < .001$[c]

[a] Determined to be of practical importance for the population with a threshold set equal to $(0.10)(S_y/S_x)$ for continuous variables and $(0.33)(S_y)$ for dichotomous variables.

[b] Determined to be of no practical importance for the population.

[c] Alpha was set at .001 because of concerns with violations of assumptions.

REFERENCES

Ackermann, S. P. (1991). The benefits of summer bridge programs for underrepresented and low-income transfer students. Community/Junior College, 15, 211-224.

Adelman, C. (1992). The way we are: The community college as American thermometer. Washington, DC: US Department of Education, Office of Educational Research and Improvement. (ERIC Document Reproduction Service No. ED 338 269)

Agresti, A. (1990). Categorical data analysis. New York: John Wiley & Sons.

Ahson, N. L., & Gentemann, K. M. (1994, May). The dilemma of the nonreturning student at a metropolitan campus. Paper presented at the annual conference of the Association for Institutional Research, New Orleans, LA.

Aitken, N. (1982). College student performance, satisfaction, and retention: Specification of a causal model. Journal of Higher Education, 53, 32-50.

Alba, R., & Lavin, D. (1981). Community colleges and tracking in higher education. Sociology of Education, 54, 223-237.

Aldrich, J. H., & Nelson, F. D. (1984). Linear probability, logit and probit models. Beverly Hills: Sage.

Allen, D. (1994, May). The Iliad and the Odyssey of student attrition. Paper presented at the annual conference of the Association for Institutional Research, New Orleans, LA. (ERIC Document Reproduction Service No. ED 373 629)

Allen, D. F., & Nelson, J. M. (1989). Tinto's model of college withdrawal applied to women in two institutions. Journal of Research and Development in Education, 22 (3), 1-11.

Allen, D., & Nora, A. (1995). An empirical examination of the construct validity of goal commitment in the persistence process. Research in Higher Education, 36 (5), 509-533.

Almanac. (1996, August). The Chronicle of Higher Education [Special issue], 43 (1).

Al-Sunbul, A. (1987). The achievement of two-year transfer students in four-year institutions: A case study. Community/Junior College Quarterly of Research and Practice, 11 (1), 1-9.

American Association of Community and Junior Colleges. (1992, February/March). Implementing student tracking systems: Concepts and issues. Community, Technical, and Junior College Journal

Anderson, E. F. (1984). Two-year comparison of transfer and native student progress at the University of Illinois at Chicago. Chicago: University of Illinois at Chicago, Office of School and College Relations.

Anderson, E. F. (1987). Two-year comparison of transfer and native student progress, University of Illinois at Chicago, fall 1984 group. Chicago: University of Illinois at Chicago, Office of School and College Relations. (ERIC Document Reproduction Service No. ED 300 056)

Anderson, K. L. (1981). Post-high school experience and college attrition. Sociology of Education, 54, 1-15.

Anderson, K. L. (1986, February). College contexts, student integration, and educational attainment. Paper presented at the annual meeting of the Association for the Study of Higher Education, San Antonio, TX. (ERIC Document Reproduction Service No. ED 268 874)

Anderson, K. L. (1987, November). Persistence, student background, and integration commitment: Variation by definition of persistence and institutional type. Paper presented at the annual meeting of the Association for the Study of Higher Education, Baltimore, MD. (ERIC Document Reproduction Service No. ED 292 380)

Anglin, L. W., & Others. (1995). Do transfer students graduate? A comparative study of transfer students and native university students. Community College Journal of Research and Practice, 19 (4), 321-330.

Archer, C. (1984). Building and coordinating educational articulation programs. Colleges and Universities, 59 (2), 176-188.

Ashar, H., & Skenes, R. (1993). Can Tinto's student departure model be applied to nontraditional students? Adult Education Quarterly, 43 (2), 90-100.

Astin, A. W. (1971). *Predicting academic performance in college.* New York: Free Press/American Council on Education.

Astin, A. W. (1972). *College dropouts: A national study.* Washington, DC: American Council on Education.

Astin, A. W. (1975). *Preventing students from dropping out.* San Francisco: Jossey-Bass.

Astin, A. W. (1977). *Four critical years: Effects of college on beliefs, attitudes and knowledge.* San Francisco: Jossey-Bass.

Astin, A. W. (1982). *Minorities in higher education: Recent trends, current prospects, and recommendations.* San Francisco: Jossey-Bass.

Astin, A. W. (1983). Strengthening transfer programs. In G. Vaughan (Ed.), *Issues for community college leaders in a new era.* San Francisco: Jossey-Bass.

Astin, A. W. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Personnel, 25* (4), 297-308.

Astin, A. W. (1985). *Achieving academic excellence.* San Francisco: Jossey-Bass.

Astin, A. W. (1993). *What matters in college: Four critical years revisited.* San Francisco: Jossey-Bass.

Astin, A. W., Tsui, L., & Avalos, J. A. (1996). *Degree attainment rates at American colleges and universities: Effects of race, gender, and institutional type.* Los Angeles: University of California, Los Angeles, Higher Education Research Institute.

Astone, B., & Nunez-Womack, E. (1990). Pursuing diversity: Recruiting college minority students. *ASHE-ERIC Report No. 7.* (ERIC Reproduction Document Service No. ED 333 857)

Astone, B., & Nunez-Womack, E. (1991, July). Pursuing diversity: Recruiting college minority students. *ERIC Digest.* Washington, DC: Office of Educational Research and Improvement. (ERIC Reproduction Document Service No. ED 333 856)

Attinasi, L. C., Jr. (1989). Getting in: Mexican Americans' perceptions of university attendance and the implications for freshman year persistence. *Journal of Higher Education, 60* (3), 247-277.

Avakian, N. C., MacKinney, A. C., & Allen, G. R. (1982). Race and sex differences in student retention at an urban university. College and University, 57, 160-165.

Banks, D. L. (1994). Effects of environmental conditions on student-transfer activity. Community College Journal of Research and Practice, 18, 245-259.

Bauer, P. F., & Bauer, K. W. (1994). The community college as an academic bridge: Academic and personal concerns of community college students before and after transferring to a four-year institution. College and University, 69 (2), 116-122.

Beal, P. E., & Noel, L. (1980). What works in student retention. Iowa City, IA: American College Testing Service.

Bean, J. P. (1980). Dropouts and turnover: The synthesis and test of a causal model of student attrition. Research in Higher Education, 12, 155-187.

Bean, J. P. (1982). Conceptual models of student attrition: How theory can help the institutional researcher. New Directions for Institutional Research, 9, (4) 17-33.

Bean, J. P. (1983). The application of a model of turnover in work organizations to the student attrition process. Review of Higher Education, 6, 129-148.

Bean, J. P. (1985). Interaction effects based on class level in an explanatory model of college student dropout syndrome. American Educational Research Journal, 22, 35-64.

Bean, J. P., & Bradley, R. K. (1986). Untangling the satisfaction-performance relationship for college students. Journal of Higher Education, 57 (4), 393-412.

Bean, J. P., & Metzner, B. S. (1985). A conceptual model of nontraditional undergraduate student attrition. Review of Educational Research, 55 (4), 485-540.

Beckenstein, L. (1992). Success rate of transfer students enrolled in a program for the underprepared at a senior college. Journal of College Student Development, 33, 56-60.

Bender, L. W. (1991). Minority transfer: A national and state legislative perspective. New Directions for Community Colleges, 74, 69-75.

Bennett, C., & Okinaka, A. M. (1990). Factors related to persistence among Asian, Black, Hispanic, and White undergraduates at a predominantly White university. Urban Review, 22 (1), 33-60.

Best, G., & Gehring, D. (1991). The academic performance of community college transfer students at a major State university in Kentucky. Community College Review, 21 (2), 32-41.

Betz, N. E. (1987). Use of discriminant analysis in counseling psychology research. Journal of Counseling Psychology, 34 (4), 393-403.

Boyle, T. P. (1989). An examination of the Tinto model of retention in higher education. NASPA Journal, 26 (4), 288-294.

Braddock, J. (1981). Desegregation and Black student attrition. Urban Education, 53, 178-186.

Braxton, J. M., & Brier, E. M. (1989). Melding organizational and interactional theories of student attrition: A path analytic study. Review of Higher Education, 13 (1), 47-61.

Braxton, J. M., Brier, E. M., & Hossler, D. (1988). The influence of student problems on student withdrawal decisions: An autopsy on autopsy studies. Research in Higher Education, 28 (3), 241-253.

Breyer, C. A. (1982). 2 + 2 still adds up to 4 in Florida. Community and Junior College Journal, 52 (8), 18-21.

Brigman, S. L., Kuh, G. D., & Stager, S. F. (1982). Why students voluntarily withdraw from college. Journal of NAWDAC, 45 (3), 3-8.

Brint, S., & Karabel, J. (1989). The diverted dream: Community colleges and the promise of educational opportunity in America, 1900-1985. New York: Oxford University Press.

Cabrera, A. F., Castañeda, M. B., Nora, A., & Hengstler, D. (1992). The convergence between two theories of college persistence. Journal of Higher Education, 63 (2), 143-164.

Cabrera, A. F., Nora, A., & Castañeda, M. B. (1993). College persistence: Structural equations modeling test of an integrated model of student retention. Journal of Higher Education, 64 (2), 123-139.

Cabrera, A. F., Stampen, J. O., & Hansen, W. L. (1990). Exploring the effects of ability to pay on persistence in college. Review of Higher Education, 13 (3), 303-336.

Carroll, D. (1987, March). The effects of grants on college persistence. Washington, DC: National Center for Educational Statistics.

Carroll, D. (1989, January). College persistence and degree attainment for 1980 high school graduates: Hazards for transfers, stopouts, and part-timers. Washington, DC: National Center for Educational Statistics.

Castillo, M. (1984, October). Underrepresentation of minorities who transfer to baccalaureate institutions. Paper presented at the annual meeting of the Association of Community College Trustees, San Antonio, TX. (ERIC Document Reproduction Service No. ED 265 999)

Cejda, B. D. (1994). Reducing transfer shock through faculty collaboration: A case study. Community College Journal of Research and Practice, 18, 189-199.

Chacón, M., Cohen, E., & Strover, S. (1986). Chicanas and Chicanos: Barriers to progress in higher education. In M. Olivas (Ed.), Latino College Students. New York: Teachers College Press.

Chapman, D. W. (1982). Resources for research on student attrition. New Directions for Institutional Research, 9, (4) 93-100.

Chartrand, J. M. (1992). Predicting academic adjustment and career indecision: A comparison of self-efficacy, interest congruence, and commitment. Journal of College Student Development, 33 (4), 293-300.

Christie, N. G., & Dinham, S. D. (1991). Institutional and external influences on social integration in the freshman year. Journal of Higher Education, 62 (4), 412-436.

Christoffel, P. (1986, October). Minority student access and retention: A review. Research and Development Update. New York: College Entrance Examination Board.

Churchill, W., & Iwai, S. (1981). College attrition, student use of facilities, and consideration of self-reported personal problems. Research in Higher Education, 14, 353-365.

Cibik, M. A., & Chambers, S. L. (1991). Similarities and differences among Native Americans, Hispanics, Blacks, and Anglos. NASPA Journal, 28 (2), 129-39.

Cleveland-Innes, M. (1994). Adult student drop-out at postsecondary institutions. Review of Higher Education, 17 (4), 423-445.

Cohen, A. M. (1984, February). The community college in the American educational system. Paper prepared for the Study Group on the Condition of Excellence in American Education. (ERIC Document Reproduction Service No. ED 239 701)

Cohen, A. M. (1987). The collegiate function of the community college. San Francisco: Jossey-Bass.

Cohen, A., & Brawer, F. (1982). Transfer and attrition, points of view: The persistent issues. Community and Junior College Journal, 52 (4), 17-21.

Cohen, A., & Brawer, F. (1987). The collegiate function of community colleges. San Francisco: Jossey-Bass.

Cohen, A., & Brawer, F. (1989). The American community college. San Francisco: Jossey-Bass.

Commission on the Future of Community Colleges. (1988). Building communities: A vision for a new century. Washington, DC: American Association of Community and Junior Colleges.

Cope, R., & Hannah, W. (1975). Revolving college doors. The causes and consequences of dropping out, stopping out, and transferring. New York: John Wiley & Sons.

Crook, D. B., & Lavin, D. E. (1989, March). The community-college effect revisited: The long-term impact of community-college entry on B.A. attainment. Paper presented at the annual meeting of the American Educational Research Association, San Francisco. (ERIC Document Reproduction Service No. ED 306 977)

Crosson, P. H. (1987, November). Environmental influences on minority degree attainment. Paper presented at the annual meeting of the Association for the Study of Higher Education, Baltimore, MD. (ERIC Document Reproduction Service No. ED 292 415)

Deegan, W. L., Tillery, D., & Associates. (1985). Renewing the American community college: Priorities and strategies for effective leadership. San Francisco: Jossey-Bass.

Demaris, A. (1992). Logit modeling: Practical applications. Beverly Hills, CA: Sage.

Diaz, P. E. (1992). Effects of transfer on academic performance of community college students at the four-year institution. *Community/Junior College Quarterly, 16,* 279-291.

Dillon, W. R., & Goldstein, M. (1984). *Multivariate analysis.* New York: John Wiley & Sons.

Donovan, R. (1984). Path analysis of a theoretical model of persistence in higher education among low-income Black youth. *Research in Higher Education, 21,* 243-258.

Doucette, D. S., & Teeter, D. J. (1985, April-May). *Student mobility among the public community colleges and universities in the State of Kansas.* Paper presented at the annual forum of the Association for Institutional Research, Portland, OR. (ERIC Document Reproduction Service No. 262 844)

Dougherty, K. J. (1987). The effects of community colleges: Aid or hindrance to socioeconomic achievement? *Sociology of Education, 60,* 86-103.

Dougherty, K. J. (1991). The community college at the crossroads: The need for structural reform. *Harvard Educational Review, 61* (3), 311-336.

Dougherty, K. J. (1992). Community colleges and baccalaureate attainment. *Journal of Higher Education, 63* (2), 188-214.

Dupraw, C., & Michael, W. B. (1995). Community college transfer students: Comparing admission and success. *College and University, 71* (2), 10-18.

Duran, R. P. (1986). Prediction of Hispanics' college achievement. In M. Olivas (Ed.), *Latino College Students.* New York: Teachers College Press.

Eaton, J. S. (1988). *Colleges of choice: The enabling impact of the community college.* New York: Macmillan/American Council on Education.

Eaton, J. S. (1991). The many faces of transfer education. *New Directions for Community Colleges, 74,* 77-85.

Eaton, S. B., & Bean, J. S. (1995). An approach/avoidance behavioral model of college student attrition. *Research in Higher Education, 36* (6), 617-645.

Ehrenberg, R., & Sherman, D. (1987). Employment while in college, academic achievement, and postcollege outcomes: A summary of results. *Journal of Human Resources, 22,* 1-23.

El-Khawas, E. (1995). Campus trends, 1995. Washington, DC: American Council on Education.

Ethington, C. A. (1990). A psychological model of student persistence. Research in Higher Education, 31 (3), 279-293.

Ethington, C., & Smart, J. (1986). Persistence to graduate education. Research in Higher Education, 24, 287-303.

Evangelauf, J. (1992, January 22). Minority groups enrollment at colleges rose 10% from 1988 to 1990, reaching record levels. Chronicle of Higher Education, p. A33, A37.

Ewell, P. T., & Jones, D. P. (1991). Assessing and reporting student progress: A response to the new accountability. Washington, DC: National Center for Educational Statistics. (ERIC Document Reproduction Service No. ED 337 112)

Farabaugh-Dorkins, C. (1991). Beginning to understand why older students drop out of college (Report No. 39). Tallahassee, FL: Florida State University, Association for Institutional Research. (ERIC Document Reproduction Service No. 332 598)

Florida Division of Community Colleges. (1997, May). College connection. [On-line]. Available: http://www.dcc.firn.edu/sbccinfo\sbccinfo.htm

Florida State Board of Community Colleges. (1991, Fall). Articulation report. Tallahassee, FL: Department of Education, Division of Community Colleges.

Florida State Board of Community Colleges. (1996, March). Articulation report. Tallahassee, FL: Department of Education, Division of Community Colleges.

Getzlaf, S. B., Sedlacek, G. M., Kearney, K. A., & Blackwell, J. M. (1984). Two types of voluntary attrition: Application of Tinto's model. Research in Higher Education, 20, 257-268.

Gilbert, S. N., & Gomme, I. M. (1986). Future directions in research on voluntary attrition from colleges and universities. College and University, 6, 227-238.

Giles-Gee, H. F. (1989). Increasing the retention of Black students: A multimethod approach. Journal of College Student Development, 30 (3), 196-200.

Gosman, E. J., Dandridge, B. A., Nettles, M. T., & Thoeny, A. R. (1983). Predicting student progression: The influence of race and other student and institutional characteristics on college student performance. Research in Higher Education, 18 (2). 209-236.

Graham, S. W. (1987). Persistence and the relationship to academic performance measures: A longitudinal study. Community College Quarterly of Research and Practice, 11 (2), 75-84.

Graham, S. W., & Dallam, J. (1986). Academic probation as a measure of performance: Contrasting transfer students to native students. Community/Junior College Quarterly of Research and Practice, 10 (1), 23-34.

Graham, S. W., & Hughes, J. C. (1994). Moving down the road: Community college students' academic performance at the university. Community College Journal of Research and Practice, 18, 449-464.

Green, D. W. (1985). Transfer education: Texas community college and university faculty attitudes (An intervention study). Unpublished doctoral dissertation. The University of Texas at Austin.

Green, D. W. (1988). Are transfer students second rate? College and University, 63 (3), 248-255.

Greer, L. R. (1980, May). Persistence and academic success among non-traditional-age students at a junior college. Paper presented at the annual forum of the Association for Institutional Research, Atlanta, GA. (ERIC Document Reproduction Service No. ED 189 942)

Gujarati, D. 1992. Essentials of econometrics. New York: McGraw-Hill.

Gujarati, D. 1995. Basic Econometrics. New York: McGraw-Hill.

Hatfield, S., & Stewart, D. (1988). Stamping out the transfer run-around. Educational Record, 69, 50-53.

Hearn, J. C. (1992). Emerging variations in postsecondary attendance patterns: An investigation of part-time, delayed, and nondegree enrollment. Research in Higher Education, 33 (6), 657-687.

Hendel, D., Teal, F., & Benjamin, B. (1984). Student attitudes about the transfer process: A comparison among three student populations. NASPA Journal, 21 (3), 13-21.

Higgerson, M. L. (1985). Understanding why students voluntarily withdraw from college. NASPA Journal, 22 (3), 15-21.

Hill, S., & Owings, M. (1986, November). Completion time for bachelor's degrees. OERI Bulletin. Washington, DC: National Center for Education Statistics. (ERIC Document Reproduction Service No. ED 276 376)

Hills, J. R. (1965). Transfer shock: The academic performance of the junior college transfer. Journal of Experimental Education, 33, 201-215.

Hirshberg, D. (1992). Sources and information: Community colleges and issues of articulation and quality. New Directions for Community Colleges, 78, 87-97.

Hilton, T. L. (1982). Persistence in higher education (College Board Report No. 82-5). Princeton, NJ: Educational Testing Service. (ERIC Document Reproduction Service No. ED 227 737)

Hodgkinson, H. L. (1992). A demographic profile of the Southeast. Washington, DC: Center for Demographic Policy Institute for Educational Leadership.

Holahan, C. K., Green, J. L., & Kelley, H. P. (1983). A six-year longitudinal analysis of transfer student performance and retention. Journal of College Student Personnel, 24 (4), 305-309.

Hood, D. W. (1992). Academic and noncognitive factors affecting the retention of Black men at a predominantly White university. Journal of Negro education, 61 (1), 12-23.

Hosmer, D. W., & Lemeshow, S. (1989). Applied logistic regression. New York: John Wiley & Sons.

House, J. D. (1989). The effect of time of transfer on academic performance of community college transfer students. Journal of College Student Development, 30, 144-147.

Huberty, C. J. (1994). Applied discriminant analysis. New York: John Wiley & Sons.

Huberty, C. J., & Barton, R. M. (1989). Methods, plainly speaking: An introduction to discriminant analysis. Measurement and Evaluation in Counseling and Development, 22, 45-55.

Hughes, J. A., & Graham, S. W. (1992). Academic performance and background characteristics among community college transfer students. *Community/Junior College Quarterly, 16,* 35-46.

Hurtado, S., Carter, D. F., & Spuler, A. (1996). Latino student transition to college: Assessing difficulties and factors in successful college adjustment. *Research in Higher Education, 37* (2), 135-157.

Jackson, G. A. (1990). Financial aid, college entry, and affirmative action. *American Journal of Education, 98* (4), 523-550.

Jensen, E. L. (1985). Student financial aid and degree attainment. *Research in Higher Education, 20* (1), 117-127.

Johnson, N. T. (1987). Academic factors that affect transfer student persistence. *Journal of College Student Personnel, 28,* 323-329.

Jones, D. J., & Watson, B. C. (1990). *High-risk students and higher education: Future trends* (ASHE-ERIC Higher Education Report No. 3). Washington, DC: The George Washington University, School of Education and Human Development.

Jones, J. C., & Lee, B. S. (1992). Moving on: A cooperative study of student transfer. *Research in Higher Education, 33* (1), 125-140.

Kayla, C. A., & Others. (1982). *Impact of the older student on undergraduate enrollment.* Paper presented at the annual conference of the Southern Association for Institutional Research, Birmingham, AL. (ERIC Document Reproduction Service No. ED 225 475)

Kempner, K., & Kinnick, M. (1990). Catching the window of opportunity: Being on time for higher education. *Journal of Higher Education, 61* (5), 535-547.

Kinnick, M., & Kempner, K. (1988). Beyond "front door" access: Attaining the bachelor's degree. *Research in Higher Education, 29* (4), 299-318.

Kintzer, F. C., & Richardson, R. C., Jr. (1986). The articulation/transfer phenomenon. *Community, Technical, and Junior College Journal, 56* (4), 17-21.

Kintzer, F. C., & Wattenbarger, J. L. (1985). *The articulation transfer phenomenon: Patterns and directions.* Washington, DC: American Association of Community and Junior Colleges.

Kissler, G., Lara, J., and Cardinal, J. (1981). Factors contributing to the academic difficulties encountered by students who transfer from community colleges to four year institutions. Paper presented at the annual meeting of the American Educational Research Association, Los Angeles, CA. (ERIC Document Reproduction Service No. ED 203 920)

Klecka, W. R. (1980). Discriminant analysis. Beverly Hills, CA: Sage.

Knoell, D. M. (1960). Institutional research on retention and withdrawal. In H. T. Sprague (Ed.), Research on college students (pp. 41-65). Boulder, CO: The Western Interstate Commission for Higher Education.

Knoell, D. M., & Medsker, L. L. (1965). From junior to senior college: A national study of the transfer student. Washington, DC: American Council on Education. (ERIC Document Reproduction Service No. ED 013 632)

Kocher, E., & Pascarella, E. (1990). The impact of four-year college transfer on the early status attainment of black-American and white-American students. Journal of College Student Personnel, 31 (2), 169-175.

Kohen, A., Nestel, G., & Karmas, C. (1978). Factors affecting individual persistence in undergraduate college programs. American Educational Research Journal, 5, 233-252.

Kraemer, B. A. (1995). Factors affecting Hispanic student transfer behavior. Research in Higher Education, 36 (3), 1995.

Lara, J. F. (1981, April). Differences in quality of academic effort between successful and unsuccessful community college transfer students. Paper presented at the annual meeting of the American Educational Research Association, Los Angeles, CA.

Lenning, O. T. (1982). Variable-selection and measurement concerns. New Directions for Institutional Research, 9, (4) 35-53.

Lenning, O. T., Beal, P. E., & Sauer, L. (1980). Retention and evidence for action and research. Boulder, CO: National Center for Higher Education Management Systems.

Leslie, L. L., & Brinkman, P. T. (1986). Rates of return to higher education. In J. Smart (Ed.), Higher education: Handbook of theory and research: Vol. 2. New York: Agathon.

Leslie, L. L., & Brinkman, P. T. (1993). The economic value of higher education. Phoenix, AZ: Oryx Press/American Council on Education.

Levin, B., & Clowes, D. (1980). Realization of educational aspirations among Blacks and Whites in two- and four-year colleges. Community/Junior college Research Quarterly, 4, 185-193.

Light, R. J., Singer, J. D., & Willett, J. B. (1990). By design: Planning research on higher education. Cambridge, MA: Harvard University Press.

Mallinckrodt, B. (1988). Student retention, social support, and dropout intention: Comparison of Black and White students. Journal of college student development, 29 (1), 60-64.

Manski, C., & Wise, D. (1983). College choice in America. Cambridge, MA: Harvard University Press.

McCauley, D. P. (1988). Effects of specific factors on Blacks' persistence at a predominantly White university. Journal of College Student Development, 29 (1), 48-51.

McClelland, K. (1990). Cumulative disadvantage among the highly ambitious. Sociology of Education, 63 (2), 102-121.

Menard, S. (1995). Applied logistic regression analysis. Thousand Oaks, CA: Sage Publications.

Metzner, B. S. (1989). Perceived quality of academic advising: The effect on freshman attrition. American Educational Research Journal, 26 (3), 422-442.

Metzner, B. S., & Bean, J. P. (1987). The estimation of a conceptual model of nontraditional undergraduate student attrition. Research in Higher Education, 27 (1), 15-37.

Miller, H. J. (1988). Minority student enrollment and retention. The Western Journal of Black Studies, 12 (2), 86-91.

Mingle, J. R. (1987). Focus on minorities: Trends in higher education participation and success. Denver, CO: Education Commission of the States/State Higher Education Executive Officers.

Munro, B. H. (1981). Dropouts from higher education: Path analysis of a national sample. American Educational Research Journal, 18 (2), 133-141.

Murdock, T. A. (1990). Financial aid and persistence: An integrative review of the literature. NASPA Journal, 27 (3), 213-221.

Nettles, M. (1984, April). Racial similarities and differences in the predictors of student college achievement. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. (ERIC Document Reproduction Service No. ED 247 843)

Newlon, L. L., & Gaither, G. H. (1980). Factors contributing to attrition: An analysis of program impact on persistence patterns. College and University, 55, 237-251.

Noel, L., Levitz, R., Saluri, D., & Associates. (1987). Increasing student retention: Effective programs and practices for reducing the dropout rate. San Francisco: Jossey-Bass.

Nora, A. (1987). Determinants of retention among Chicano college students: A structural model. Research in Higher Education, 26 (1), 31-59.

Nora, A. (1990). Campus-based aid programs as determinants of retention among Hispanic community college students. Journal of Higher Education, 61 (3), 312-31.

Nora, A. (1996). Differential impacts of academic and social experiences on college-related behavioral outcomes across different ethnic and gender groups at four-year institutions. Research in Higher Education, 37 (4), 427-451.

Nora, A., Attinasi, L. C., & Matonak, A. (1990). Testing qualitative indicators of precollege factors in Tinto's attrition model: A community college student population. Review of Higher Education, 13 (3), 337-355.

Nora, A., & Cabrera, A. F. (1993). The construct validity of institutional commitment: A confirmatory factor analysis. Research in Higher Education, 34 (2), 243-262.

Nora, A., & Horvath, F. (1989). Financial assistance: Minority enrollments and persistence. Education and Urban Society, 21 (3), 299-311.

Nora, A., & Rendón, L. I. (1990). Determinants of predisposition to transfer among community college students: A structural model. Research in Higher Education, 31 (3), 235-255.

Norušis, M. J. (1994a). SPSS advanced statistics 6.1. Chicago: SPSS.

Norušis, M. J. (1994b). SPSS professional statistics 6.1. Chicago: SPSS.

Nunley, C. R., & Breneman, D. W. (1988). Defining and measuring quality in community college education. In J. Eaton (Ed.), Colleges of choice: The enabling impact of the community college. New York: Macmillan/American Council on Education.

Olivas, M. (1986). Latino college students. New York: Teachers College Press.

Pantages, T. J., & Creedon, C. F. (1978). Studies of college attrition: 1950-1975. Review of Educational Research, 48 (1), 49-101.

Pascarella, E. T. (1980). Student-faculty informal contact and college outcomes. Review of Educational Research, 50 (4), 545-595.

Pascarella, E. T. (1982). Validation of a theoretical model of college dropouts. Washington DC: National Institute of Education. (ERIC Document Reproduction Service No. ED 221 130)

Pascarella, E. T. (1985). Racial differences in factors associated with bachelor's degree completion: A nine-year follow-up. Research in Higher Education, 23 (4), 351-373.

Pascarella, E. T., & Chapman, D. (1983a). A multi-institutional path analytic validation of Tinto's model of college withdrawal. American Educational Research Journal, 20 (1), 87-102.

Pascarella, E. T., & Chapman, D. (1983b). Validation of a theoretical model of college withdrawal: Interaction effects in a multi-institutional sample. Research in Higher Education, 19, 25-48.

Pascarella, E. T., Duby, P., & Iverson, B. K. (1983). A test and reconceptualization of a theoretical model of college withdrawal in a commuter institutional setting. Sociology of Education, 56 (2), 88-100.

Pascarella, E. T., Ethington, C. A., & Smart, J. C. (1988). The influence of college on humanitarian/civic involvement values. Journal of Higher Education, 59, 412-437.

Pascarella, E. T., Smart, J. C., & Ethington, C. A. (1986). Long-term persistence of two-year college students. Research in Higher Education, 24 (1), 47-71.

Pascarella, E. T., Smart, J. C., Ethington, C. A., & Nettles, M. (1987). The influence of college on self-concept: A consideration of race and gender differences. American Educational Research Journal, 24, 49-77.

Pascarella, E. T., & Terenzini, P. T. (1977). Patterns of student-faculty informal interaction beyond the classroom and voluntary freshman attrition. Journal of Higher Education, 48 (5), 540-552.

Pascarella, E. T., & Terenzini, P. T. (1979). Interaction effects in Spady''s and Tinto's conceptual models of college student dropout. Sociology of Education, 52, 197-210.

Pascarella, E. T., & Terenzini, P. T. (1980). Predicting freshman persistence and voluntary dropout decisions from a theoretical model. Journal of Higher Education, 51 (1), 60-75.

Pascarella, E. T., & Terenzini, P. T. (1983). Predicting voluntary freshman year persistence/withdrawal behavior in a residential university: A path analytic validation of Tinto's model. Journal of Educational Psychology, 75 (2), 215-226.

Pascarella, E. T., & Terenzini, P. T. (1991). How college affects students: Findings and insights from twenty years of research. San Francisco: Jossey-Bass.

Pascarella, E. T., Terenzini, P. T., & Wolfe, L. (1986). Orientation to college and freshman year persistence/withdrawal decisions. Journal of Higher Education, 57, 155-175.

Peng, S. (1977). Withdrawal from institutions of higher education. Washington, DC: National Center for Education Statistics.

Peterson, J., & Bailey, S. (1986). Interim report on the AAC-Mellon project from Knox College. Galesburg, IL: Knox College. (ERIC Document Reproduction Service No. ED 271 131)

Phlegar, A. G., Andrew, L. D., & McLaughlin, G. W. (1981). Explaining the academic performance of community college students who transfer to a senior institution. Research in Higher Education, 15 (2), 75-84.

Pincus, F., & Archer, E. (1989). Bridges to opportunity: Are community colleges meeting the transfer needs of minority students? New York: Academy for Educational Development/College Entrance Examination Board.

Pincus, F. L., & DeCamp, S. (1989). Minority community college students who transfer to four-year colleges: A study of a matched sample of B.A. recipients and non-recipients. Community/Junior College, 13, 191-219.

Pindyck, R. S., & Rubinfeld, D. L. (1981). Econometric models and economic forecasts. London: McGraw-Hill.

Porter, O. F. (1990). Undergraduate completion and persistence at four-year colleges and universities: Detailed findings. Washington, DC: National Institute of Independent Colleges and Universities.

Pounds, H. R., & Anderson, B. (1989). Undergraduate student transfer report summary. Atlanta, GA: University System of Georgia. (ERIC Document Reproduction Service No. ED 314 146)

Ramist, L. (1981). College student attrition and retention. Findings, 6 (2), 1-4.

Remley, T. P. Jr., & Stripling, R. O. (1983). Perceptions of transfer problems experienced by community college graduates. Journal of College Student Personnel, 24 (1), 43-49.

Rendón, L. I. (1993). Eyes on the prize: Students of color and the bachelor's degree. Community College Review, 21 (2), 3-13.

Rendón, L. I., & Matthews, T. B. (1989). Success of community college students: Current issues. Education and Urban Society, 21 (3), 312-327.

Rendón, L. I., & Nora, A. (1987). Hispanic students: Stopping the leaks in the pipeline. Educational Record, 68, 79-85.

Rendón, L. I., & Nora, A. (1988). Salvaging minority transfer students: Toward new policies that facilitate baccalaureate degree attainment. (ERIC Document Reproduction Service Number ED 305 098)

Richardson, R. C., & Bender, L. (1987). Fostering minority access and achievement in higher education. San Francisco: Jossey-Bass.

Richardson, R. C., & Doucette, D. (1980). Persistence, performance, and degree achievement of Arizona's community college transfer in Arizona's public universities. (ERIC Document Reproduction Service Number ED 197 785)

Richardson, R. C., & Doucette, D. (1982). The transfer function: Alive and well in Arizona. Community and Junior College Journal, 52 (8), 10-13.

Robertshaw, D., & Wolfle, L. (1983). Discontinuities in schooling and educational attainment. Higher Education, 12, 1-18.

Rootman, I. (1972). Voluntary withdrawal from a total adult socializing organization: A model. Sociology of Education, 45 (3), 258-270.

Rummel, R. J. (1970). Applied factor analysis. Evanston, IL: Northwestern University Press.

Scott, J., & Gelb, L. (1983). A computer assisted transfer program. College and University, 59 (1), 49-59.

Sedlacek, W. E. (1987). Black students on White campuses: 20 years of research. Journal of College Student Personnel, 28 (6), 484-95.

Sedlacek, W. E. & Webster, D. (1978). Admission and retention of minority students in large universities. Journal of College Student Personnel, 19, 242-248.

Smart, J. C. (1986). College effects on occupational status attainment. Research in Higher Education, 24, 73-95.

Spady, W. G. (1970). Dropouts from higher education: An interdisciplinary review and synthesis. Interchange, 1 (1), 64-85.

Spady, W. G. (1971). Dropouts from higher education: Toward an empirical model. Interchange, 2 (3), 38-62.

SPSS, Inc. (1996). SPSS Advanced Statistics 7.0 Update. Chicago: SPSS Inc.

St. John, E. P. (1991). What really influences minority attendance? Sequential analysis of the high school and beyond sophomore cohort. Research in Higher Education, 32 (2) 141-58.

St. John, E. P., & Noell, J. (1989). The effects of student financial aid on access to higher education: An analysis of progress with special consideration of minority enrollment. Research in Higher Education, 30 (6), 563-581.

Stage, F. K. (1987). University attrition: LISREL with logistic regression for the persistence criterion. Research in Higher Education, 32, 343-357.

Stage, F. K., & Rushin, P. W. (1993). A combined model of student predisposition to college and persistence in college. Journal of College Student Development, 34, 276-281.

Stampen, J., & Cabrera, A. (1988). The targeting and packaging of student aid and its effect on attrition. Economics of Education Review, 7 (1), 29-46.

Stampen, J. O., & Fenske, R. H. (1988). The impact of financial aid on ethnic minorities. The Review of Higher Education, 11 (4), 337-353.

Stark, J., & Bateman, H. (1981). Transfer students' academic progress at the University of California and the California state universities and colleges. (ERIC Document Reproduction Service No. ED 196 503)

State University System of Florida. (1992). Student data course file enrollment report, fall 1991. Tallahassee, FL: Author.

State University System of Florida. (1996). State University System data dictionary. Tallahassee, FL: Author.

State University System of Florida. (1997, May). State University System of Florida. [On-line]. Available: http://www.bor.state.fl.us/gen/about.htm

State University System of Florida. (1997, December). Accountability Report. Tallahassee, FL: Author.

Stevens, J. (1992). Applied multivariate statistics for the social sciences. Hillsdale, NJ: Lawrence Erlbaum Associates.

Steward, R. J., Jackson, M. R., Sr., & Jackson, J. D. (1992). Alienation and interactional styles in a predominantly White environment: A study of successful Black students. Journal of College Student Development, 31 (6), 509-515.

Stoecker, L., Pascarella, E. T., & Wolfle, L. (1988). Persistence in higher education: A nine-year test of a theoretical model. Journal of College Student Development, 29, 196-209.

Summerskill, J. (1962). Dropouts from college. In N. Sanford (Ed.), The American college. New York: John Wiley & Sons.

Swift, J. S., Jr. (1986). The community college transfer and "plus two" programs: Access to a baccalaureate degree in four years? Community/Junior College Quarterly, 10, 307-316.

Tabachnick, B. G., & Fidell, L. S. (1996). Using multivariate statistics. New York: HarperCollins College Publishers.

Tate, R. (1995). EDF supplemental materials. Unpublished course materials, Florida State University, Tallahassee, FL.

Tate, R. (1996). An introduction to modeling outcomes in the behavioral and social sciences. Edina, MN: Burgess International Group.

Temple, M., & Polk, K. (1986). A dynamic analysis of educational attainment. Sociology of Education, 59, 79-84.

Terenzini, P. T. (1982). Designing attrition studies. New Directions for Higher Education, 14 (1), 55-71.

Terenzini, P. T., Lorang, W. G., & Pascarella, E. T. (1981). Predicting freshman persistence and voluntary dropout decisions: A replication. Research in Higher Education, 15 (2), 109-127.

Terenzini, P. T., & Pascarella, E. T. (1977). Voluntary freshman attrition and patterns of social and academic integration in a university: A test of a conceptual model. Research in Higher Education, 6, 25-43.

Terenzini, P. T., & Pascarella, E. T. (1978). The relation of student's pre-college characteristics and freshman year experience to voluntary attrition. Research in Higher Education, 7, 347-366.

Terenzini, P. T., & Pascarella, E. T. (1980). Toward the validation of Tinto's model of college student attrition: A review of recent studies. Research in Higher Education, 12 (3), 271-282.

Terenzini, P. T., Pascarella, E. T., Theophilides, C., & Lorang, W. (1985). A replication of a path analytic validation of Tinto's theory of college student attrition. Review of Higher Education, 8, 319-340.

Theophilides, C., & Terenzini, P. T. (1981). The relationship between nonclassroom contact with faculty and student's perceptions of instructional quality. Research in Higher Education, 15 (3), 255-269.

Thomas, G. E., & Gordon, S. A. (1983). Evaluating the payoffs of college investments for Black, White, and Hispanic students (Report No. 344). Baltimore: Johns Hopkins University, Center for Social Organization of Schools. (ERIC Document Reproduction Service No. ED 235 733)

Thompson, C. E., & Fretz, B. R. (1991). Predicting the adjustment of black students at predominantly white institutions. Journal of higher education, 62 (4), 437-450.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. Review of Educational Research, 45 (1), 89-125.

Tinto, V. (1982). Defining dropout: A matter of perspective. New Directions for Higher Education, 14 (1), 3-16.

Tinto, V. (1987). Leaving college: Rethinking the causes and cures of student retention. Chicago: University of Chicago Press.

Tinto, V. (1988). Stages of student departure: Reflections on the longitudinal character of student leaving. Journal of Higher Education, 59 (4), 438-455.

Townsend, B. K. (1993). Community college transfer students in an urban university: Survival of the fittest? Unpublished manuscript, Loyola University, Chicago, IL.

Townsend, B. K., McNerny, N., & Arnold, A. (1993). Will this community college transfer student succeed? Factors affecting transfer student performance. Community College Journal of Research and Practice, 17, 433-443.

Tracy, T. J., & Sedlacek, W. E. (1987). A comparison of White and Black student academic success using noncognitive variables: A LISREL analysis. Research in Higher Education, 27 (4), 333-348.

Trippi, J., & Cheatham, H. E. (1989). Effects of special counseling programs for Black freshmen on a predominantly White campus. Journal of College Student Development, 30 (1), 35-40.

Trippi, J., & Cheatham, H. E. (1991). Counseling effects on African American college student graduation. Journal of College Student Development, 32 (4), 342-349.

Upcraft, M., Gardner, J., & Associates (1989). The freshmen year experience: Helping students survive and succeed in college. San Francisco: Jossey-Bass.

U.S. Department of Education. (1989). Digest of education statistics 1989 (NCES Publication No. 89-643). Washington, DC: Government Printing Office.

U.S. Department of Education. (1993). The condition of education (NCES Publication No. 93-290). Washington, DC: Government Printing Office.

U.S. Department of Education. (1995). The condition of education (NCES Publication No. 95-273). Washington, DC: Government Printing Office.

U.S. Department of Education. (1997). Transfer behavior among beginning postsecondary students (NCES Publication No. 97-266). Washington, DC: Government Printing Office.

Vaala, L. (1989). Preference of transfer students for a transfer program. Community College Review, 16 (4), 28-37.

Velez, W. (1985). Finishing college: The effects of college type. Sociology of Education, 58, 191-200.

Velez, W., & Javalgi, R. G. (1987). Two-year college to four-year college: The likelihood of transfer. American Journal of Education, 96, 81-94.

Villella, E. F., & Hu, M. (1991). A factor analysis of variables affecting the retention decision of nontraditional college students. NASPA Journal, 28 (4), 334-341.

Voorhees, R. A. (1987). Toward building models of community college persistence: A logit analysis. Research in Higher Education, 26 (2), 115-129.

Walleri, R. D. (1990). Tracking and follow-up for community college students: Institutional and statewide initiatives. Community/Junior College, 14, 21-34.

Webb, E. (1985). Follow up study of transfer students from C.O.S. to California State University, Fresno, & California Poly-Technic State University, San Luis Obispo, fall, 1984. Visalia, CA: College of the Sequoias, Office of Institutional Research. (ERIC Document Reproduction Service No. ED 269 076)

Wiencke, W. R. (1994). Validation of a theory based retention model for a four year undergraduate architecture program (Doctoral dissertation, Florida State University, 1994). Dissertation Abstracts International.

Wolfle, L. (1985). Postsecondary educational attainment among Whites and Blacks. American Educational Research Journal, 22 94), 501-525.

Young, F. H. (1982). Assessment, historical perspective, and prediction of the academic performance at senior institutions of transfer students from a multi-campus community college district. Los Angeles: University of Southern California. (ERIC Document Reproduction Service No. ED 248 925)

Zimmerman, W. W. (1981). A study of the academic success of students changing from a regional campus to the central campus of Ohio State University. Columbus, OH: Ohio State University, Office of Institutional Research. (ERIC Document Reproduction Service No. ED 225 621)

BIOGRAPHICAL SKETCH

Dorothy J. Minear

EDUCATION

Ph.D. 1998	Educational Leadership - Higher Education Administration (Minor: Educational Research). Florida State University, Tallahassee, Florida. Phi Kappa Phi National Honor Society. Pi Lambda Theta International Honor Society. GPA (grade-point average): 4.0.
Ed.S. 1991	Higher Education - Concentration in Developmental Studies. Appalachian State University, Boone, North Carolina. GPA: 4.0.
M.A. Ed. 1982	Guidance and Counseling - Two-Year College (Student Personnel). Western Carolina University, Cullowhee, North Carolina. GPA: 4.0.
B.S. 1975	Mathematics. Second Emphasis in German. Mars Hill College, Mars Hill, North Carolina. (Junior Year at the University of Munich, Germany.) Cum Laude. Who's Who Among Students of American Colleges and Universities.

ADDITIONAL CERTIFICATION AND TRAINING

- Certification in Program Evaluation. Florida State University.
- Certification as Specialist in Developmental Education. Kellogg Institute for the Training and Certification of Developmental Educators. Appalachian State University.
- Advanced Kellogg Institute - National Center for Developmental Education, 1986, 1990.
- Supplemental Instruction Training. University of Missouri at Kansas City, 1986.
- Vocational Evaluation Certification. Auburn University, 1979.
- Beginning and Intermediate American Sign Language.
- Usui System of Natural Healing (Reiki) - First and Second Degree.
- Training on various computer programs, including word processing, spreadsheet, relational database, graphics, desktop publishing, and statistical programs.

EMPLOYMENT HISTORY

1997-Present ASSISTANT DIRECTOR, ACADEMIC PROGRAM REVIEW, for the State University System of Florida Board of Regents.

1992-1997 ACADEMIC PROGRAM REVIEW COORDINATOR for the State University System of Florida Board of Regents.

1986-1990 LEARNING CENTER COORDINATOR/LEARNING ASSISTANCE SPECIALIST, The University of North Carolina at Charlotte. Served as an adjunct LECTURER in the Department of Curriculum and Instruction. Served as University TUTORING COORDINATOR (1986-1987). Served as the Student Support Services READING SPECIALIST (1988-1990). Served as ASSISTANT DIRECTOR for Student Support Services grant on a half-time basis (1988-1989).

1984-1986 DIRECTOR OF LEARNING CENTER/INSTRUCTOR OF STUDY SKILLS/MATHEMATICS, Pfeiffer College, Misenheimer, North Carolina.

1983 HEAD RESIDENT, University of Tennessee at Knoxville.

1982-1983 RESIDENCE HALL/RESIDENCE LIFE COORDINATOR (COORDINATOR OF PROGRAMMING AND STUDENT STAFF SELECTION AND TRAINING), Mary Washington College, Fredericksburg, Virginia.

1981-1982 UNIVERSITY INSTRUCTOR, Western Carolina University, Cullowhee, North Carolina.

1977-1981 VOCATIONAL EVALUATOR, Haywood Technical College, Clyde North Carolina.

SELECTED PROFESSIONAL ACTIVITIES

1998 "Undergraduate Educational Attainment Patterns of Public Community College Students Who Transferred with the Associate in Arts Degree into a State University System." Paper presented at the 38th Annual Forum of the Association for Institutional Research, Minneapolis, MN.

1995 - Present Member, The State Council for Florida's Comprehensive System of Personnel Development, a function of the State Plan for the Bureau of Student Services and Exceptional Education, Department of Education, under IDEA (Individuals

	with Disabilities Education Act). Designed to increase the quality and quantity of personnel in Florida.
1993 - Present	Coordinated reviews of the Teacher Education, Philosophy, Religion, Parks, Recreation, Leisure, Fitness Studies, Mathematics, and Statistics programs in the State University System of Florida.
1993 - Present	Member, the Florida Department of Education Teacher Education Program Approval Board, responsible for making final recommendations to the Commissioner of Education regarding the approval of teacher preparation programs in the State of Florida.
1992	"Personnel Evaluation Strategies in Higher Education: Critical Skills for Aspiring Female Administrators." *Hardee Center Collection of Papers on Women Administrators*, Fall 1992, Volume 1, Tallahassee, FL.
1990	Team leader for national task force at Advanced Kellogg Institute, Boone, North Carolina. Topic: "Teaching for Thoughtful Learning in Postsecondary Education."
1987-1991	National Association for Developmental Education - Member of National Advisory Council (1988-89). Served on Ethics and Standards Committee and on Evaluation Committee. Chairperson of the Adjunct Instructional Programs Subcommittee of the Professional Standards and Evaluation Committee.
1986-1991	North Carolina Association for Developmental Studies - Advisory Board (1989-91) and Chairperson (1989-90); Executive Board (1988-90); President (1988-89); President-Elect/State Conference Coordinator (1988); Political Action Committee (1989-90); Constitution Committee (1986-88); Western Regional Conference Committee (1987).
1988	University of South Carolina at Salkehatchie, Allendale, South Carolina. Served as Title III consultant who evaluated the institution's progress toward meeting grant requirements.
1988	Virginia Association for Developmental Education State Conference, Williamsburg, Virginia. Topic: "An Introduction to Supplemental Instruction."
1988	North Carolina Association for Children with Learning Disabilities State Conference, Charlotte, North Carolina. Topic: "Learning Disabled College Students: Strategies for Success Using a Comprehensive Program."

1988 North Carolina Association for Developmental Studies: Western Regional Conference. Topic: "Resources? Creative Ideas?"

1987 North Carolina Association for Developmental Studies/North Carolina Community College Association for Adult Educators State Conference. Topic: "Tutor Certification: A Possibility in North Carolina?"

1987 Rockingham Community College, Wentworth, North Carolina. Served as consultant responsible for assessing developmental studies/learning assistance efforts on campus and for providing recommendations for expansion of services.

1987 University of South Carolina at Salkehatchie, Allendale, South Carolina. Served as Title III consultant who evaluated the institution's progress toward meeting grant requirements, and provided additional recommendations for the learning assistance efforts on campus.

1987 University of North Carolina - General Administration. Served as a member of consulting team responsible for evaluating the student affairs, services, programs, and academic support services at one of the State universities.

1987 Association of Teacher Educators: National Meeting. Topic: "Dealing with the Underprepared College Student."

1985 Project MATCH: National Invitational Conference on Pedagogy and Practice for Student Intellectual Development, Davidson College, Davidson, North Carolina. Topic: "Developing Underprepared Students for Higher Learning." Also, served on Mathematics Working Committee.

1982 North Carolina State Department of Public Instruction. As consultant, presented topic: "Employability Skills - Product and Process Evaluation of the Mentally Handicapped."